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SWINE HUSBANDRY.

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PREFACE.

There has been a greater demand, in recent years, for home grown pork in the markets of Pennsylvania than formerly, owing, no doubt, to the fact that pork consumption during the summer months has become quite common. This was something almost entirely unknown until within the last few years.

The danger and difficulty attending the shipping of fat hogs long distances in hot weather renders it difficult for Pennsylvania butchers to get their summer supply from the great pork producing states of the Middle West, and, hence, the increasing demand for pork production in our own State.

With well-bred stock, comfortable and well-adapted quarters and judicious feeding, pork production can be made to pay a reasonable profit.

In order to encourage this industry and give help to those already engaged in it, this Department has had the following bulletin prepared by one whose investigation of the scientific principles underlying the subject, as well as his practical experience, entitles him to the confidence of those who are seeking information in relation to the same.

The author has for years made the subject of Animal Husbandry a special study and is at the present time Farm Superintendent at one of the most popular Agricultural Colleges in America. His characteristic modesty has induced him to withhold his name from title page and introduction, but the bulletin commends itself to all who are competent to pass upon its merit, and it gives me pleasure to say that my acquaintance with him and his work assures me that he "speaks that which he knows and testifies that which he has seen."

N. B. CRITCHFIELD,
Secretary of Agriculture.

SWINE HUSBANDRY.

THE PLACE OF THE HOG UPON THE FARM.

The swine industry occupies a rather peculiar position in many localities. Swine multiply rapidly and come into use for breeding at an earlier age than other farm animals; consequently, it takes only a short time for farmers to increase or decrease their stock, as the case may be. When, owing to scarcity in the supply of hogs, the price for hogs goes up, we find farmers increasing the number of breeding sows, and in a very short time the supply of hogs coming to market increases to such an extent that the price is likely to break. If the decrease in price is very severe, the farmer becomes disgusted, and the chances are that many farmers will sell their breeding sows and practically go out of the business. This unloading process adds to the burden of the market, and general demoralization is apt to follow. By-and-by, after the market has absorbed the excessive supplies thrown upon it, a scarcity occurs again, owing to so many having gone out of the business of hog raising, and prices once more reach a high level. This is a signal for farmers to rush again into hog raising, and overstock their farms in many cases, so that once more the market becomes top-heavy, and the history of the hog market repeats itself. Now, it is altogether probable that very few of those who were tempted to rush into the business on account of high prices obtained any profit from the venture. They paid high prices for breeding stock, but by the time they had hogs ready for the market, the decline in prices began, and before they were through they were selling their hogs at a loss. The man who makes money out of hogs is the man who has hogs to sell when prices are high, whose farm is never over-stocked, nor yet entirely depleted of its supply. He knows how many hogs his farm will carry to advantage under average circumstances, and he practices a wise conservatism. When prices are high, he has a good profit, when they are low, his profit is small, but the average is fairly satisfactory. He

may slightly expand or contract his operations at various times, but he never "plunges." The "plunger" is apt to find himself "in" when he ought to be "out," and "out" when he ought to be "in." The other man is "in" at all times, but never to such an extent as to be seriously damaged when the market goes wrong.

It is not the object of the writer to urge farmers to feed more hogs—far from it. Every farmer must be his own judge in this matter, and many farmers should never attempt to raise hogs, owing to the fact that either the man himself is not adapted to the business, or his conditions are unsuitable. Nevertheless, it is true that a few hogs might be kept profitably upon many farms where they do not find a place to-day. Generally speaking, the hog may be regarded as a by-product of the farm, or, in other words, he is a means of marketing the by-products of the farm. In the cattle feed lots, we find him utilizing the corn which the cattle have failed to digest and which otherwise would be wasted. In the dairy district, he is the means of obtaining good value for skim milk, buttermilk, and whey. Where mixed farming is practiced, he consumes any dairy by-products, small potatoes, and various other unmarketable substances, and gleans the stubble fields, returning to his owner cash value for substances that are completely neglected on many farms. Even the cottager frequently utilizes him to obtain a cash return from kitchen refuse and table scraps. It is as a consumer of by-products and so-called worthless materials, that the hog shows to the best advantage from the standpoint of profit.

There is also another consideration. The farmer who raises most of his own feed is in a much better position to feed hogs, or any other class of stock, than the man who has to purchase all his feed. The farmer who grows his own feed may not get any more than market prices for the grain, or other produce consumed by the hogs, and may still have a fair profit through selling his produce at market prices in the form of pork; but the man who buys his feed can have for profit only what he obtains in excess of the market value of the foods consumed by the hogs. Thus the farmer who grows his feed has two sources of profit, namely, the grower's profit, or the profit obtained by selling his produce at market price; together with the feeder's profit, or what he obtains for his produce in excess of market price by selling it in the form of pork. The man who has to buy all the produce which he feeds his hogs can have only the feeder's profit, and under unfavorable conditions, this profit may be so small that it will scarcely pay for the labor involved.

Another point worthy of consideration is the fact that under favorable conditions and skilful management young pigs can be raised for feeding at a lower cost than that for which they can be bought. This point will be dealt with more fully in another

place, but is mentioned here as one of the factors which help to explain why some people can make hog feeding profitable, while others cannot.

One of the great difficulties in connection with the swine industry is the fact that so many people are not content to engage in the undertaking except on a large scale, and the people who can handle hogs in large numbers and make the business a financial success are comparatively few. The average farmer is safer to handle hogs in rather small numbers, and use them as an adjunct to his other farm operations. Used in this way, and handled with a reasonable degree of judgment, the hog will give a good account of himself in adding to the revenue and the profits from the farm. A very few years' experience should enable a farmer to determine just about how many hogs he can handle to advantage. Some farms will carry very large numbers owing to the system of farming which is carried on, but for many of the smaller farms, one breeding sow is plenty.

The hog fits in especially well upon dairy farms where skim milk, buttermilk, or whey has to be fed upon the farm. Perhaps no animal will give as high returns for dairy by-products consumed, as the hog, and no food gives a finer quality of bacon than dairy by-products. It is also worthy of note that the man who has skim milk is in a better position to raise pigs than the man who has none, for the reason that it is difficult to find a satisfactory substitute for skim milk for young pigs just after weaning.

What has been said in the preceding paragraphs has no reference to the breeding of pure-bred hogs for breeding purposes, but applies simply to the production of market hogs. The breeders of pure-bred hogs understand their business, and know about how far their conditions warrant the extension of their operations, so that it would be out of place to offer suggestions to them along this line. It is true that the breeder of market hogs always has a use for pure blood, but it is not every person who can make a success of breeding pure-breds to supply the demand for breeding stock, and the average farmer is safer to adhere to producing market hogs.

To sum up, it may be said that the hog is especially valuable for consuming the by-products of the farm, and the number of hogs carried to advantage upon a farm is governed very largely by the quantity and character of the by-products to be consumed. When carried in appropriate numbers, the hog is an exceptionally economical producer of meat, preventing waste, and giving cash returns for substances that are frequently wasted, or which have little market value. Trying to take advantage of fluctuating market prices by alternately over-stock and under-stocking with hogs is seldom a financial success. The man who consistently follows up the business upon conservative lines, is the man who is well satisfied with the hog as a source of profit.

The Breeder. The business of the stock-breeder is a peculiar one. He has to deal with life, and all those mysterious possibilities that exist in the living creature have to be reckoned with in his operations. It is not a matter of fixed rules. No man can map out a system which will apply to all cases, and give a definite result with absolute certainty. The successful breeder requires a thorough knowledge of his business, and the ability to reason accurately, so that he may modify his methods and adapt them to the requirements of each individual problem which comes before him. Knowledge of general principles can be acquired from books, but the successful application of those principles must be learned, very largely, in the school of experience. Theory and practice must go hand in hand, and knowledge must be combined with reason; but the really great breeder seems to possess a sort of intuitive genius, given to the very few, and hence great breeders are not common. Another thing necessary to success is a love for animals. If a man dislikes hogs, he had better not attempt to breed them, because failure is sure to follow. It is the enthusiastic lover of a breed of animals who will make the greatest success in breeding them. Finally, there can be no progress unless the breeder has a very clear ideal before him towards which he is working, which implies, of course, that he must be a thorough judge of the breed he handles. He may never reach his ideal, but he must never lose sight of it. No matter how much money may be invested in the enterprise, it will amount to nothing, unless the breeder has a clearly defined object in view. He will meet with many things to try his faith, but he must not waver; he will be frequently cast down, but he must not despair. Difficulties, disappointments and hope deferred are part of the heritage of the breeder, and he requires the highest class of courage to be able to stick to his guns and eventually bring victory out of what appeared to be certain defeat. There is no "royal road" to success as a breeder, and while there may be few who attain to greatness, there is no reason why any man should not attain a reasonable degree of success in breeding swine, providing he possesses a liking for these animals, and a determination to conquer the difficulties incident to the undertaking.

Utility. Every breeder should ask himself why he is breeding the animals of his choice. Is it to humor the whims of the few, or to meet the demands of the many? If his work as a breeder is to be a success, he must never lose sight of the requirements of the man who produces the market hog for the money that is in it. No matter how pure the blood, or how perfect the type from the breeder's standpoint, if the hog does not meet the requirements of the packer, if it is not suitable to paying the rent and lifting the mortgage when placed

in the hands of the average farmer, then all the effort employed in its production has been wasted. The watchword of the truly successful breeder must be *utility*. Utility is the touchstone upon which each breeder's work will be tested. If his work stands the test, it will surely meet with recognition, but if it fails in the test it will ultimately disappear and be forgotten. Every step in the breeder's operations must be dominated by this one great consideration, and if he ever loses sight of the importance of utility, he need never hope to achieve lasting distinction as a breeder.

Utility must be viewed from two standpoints. The butcher requires an animal that will give him the largest proportion of valuable meat, and the farmer requires an animal that will reproduce its kind in profitable numbers, and make rapid and economical gains. There would be little use in aiming to please the butcher if the animal did not meet the requirements of the farmer, but the butcher must not be left out of consideration if a really useful animal is to be produced. In breeding operations, therefore, both these men must be kept in view, and the breeding, feeding, and killing qualities must each receive a due share of attention.

Inbreeding. It is not intended to attempt a general discussion of the principles of breeding, but the question of inbreeding, that is, the mating of animals that are closely related, is of such importance that it is deserving of some notice in a publication dealing with swine husbandry.

That very successful Berkshire breeder, Mr. N. W. Gentry, read a paper before the American Swine Breeders' Association, in which he gives his experience in inbreeding Berkshires. His experience extends over a considerable number of years, and the following statement is taken from his paper:

"Neither inbreeding nor the reverse will be a success unless matings are made with animals suited to each other, that is, having no weakness in common if possible, and as much good in common as possible. This, in my opinion, is the key to success in all breeding operations and success will come in no other way. In my opinion, inbreeding as a rule is very good or very bad. If you intensify the blood of animals that are good, you do good, but if they are bad, you go wrong as fast or faster than you go right in the other case. If it is true that inbeeding intensifies weakness of constitution, lack of vigor, or too great fineness of bone, as we all believe, is it not as reasonable and as certain that you can intensify strength of constitution, heavy bone, or vigor, if you have those traits well developed in the blood of the animals you are inbreeding with? The latter is certainly my belief and experience. * * * I believe there is little or nothing to fear from kinship of animals mated if they are suited to be mated together."

Mr. Gentry states that he has not used a boar other than his own breeding for twenty years, and describes the good results from using the great boar Longfellow, 16,835, and Longfellow's sons and

grandsons in his herd. One instance is a boar he showed at the World's Fair in Chicago in 1893. This boar weighed 660 pounds at 13 months and 6 days of age, and possessed as much action, strength, vigor and masculine development as any boar he ever saw. The sire of this boar was a son of Longfellow, the dam was a daughter of Longfellow, and the sire of the dam was by the sire of Longfellow. This is an example of very close inbreeding producing remarkably good results.

Many prominent swine breeders resort to inbreeding at times. A very successful breeder told the writer that he did not care to practice very close breeding as a rule, but he would not hesitate to mate animals as closely related as cousins. Mr. Gentry states that at first he practiced inbreeding through necessity, not being able to find boars outside his own herd which he thought suitable for his use. No doubt many a breeder has found himself in a similar position at times, and there is no doubt that a certain amount of inbreeding would be preferable to using unrelated males which were of inferior quality.

As we study the history of animal breeding, we find that inbreeding has played an important part in the improvement of practically all breeds of livestock. It concentrates the blood and makes animals more prepotent, that is to say, causes them to transmit their own qualities to their progeny with greater certainty. In this respect, therefore, inbreeding is beneficial, but it must not be forgotten that it will fix bad qualities as well as good ones. Mr. Gentry strikes the keynote when he says: "I believe there is little or nothing to fear from kinship of animals mated if they are suited to be mated together." But how many men are capable of discerning whether the animals are suited to one another or not? Mr. Gentry states that if the animals are bad, a person will go wrong very fast by practicing inbreeding. The chances are that more than ninety-nine per cent. of the men breeding swine to-day could not say with any degree of certainty whether a given pair of animals were suited to be mated together, and since bad results are likely to follow an error in judgment, it seems safe to assume that inbreeding is something to be practiced only by the few. It requires a master of the art of breeding to practice inbreeding with success, and in the history of stock breeding, we read of some of the greatest breeders the world has known who were compelled to resort to the introduction of fresh blood after persistently following inbreeding for a considerable time. It will be safer, therefore, for the average breeder to avoid inbreeding, and to leave the practice in the hands of those who are exceptionally skilful in the art of breeding. If a breeder happened to secure a boar of exceptional excellence as a stock getter, he might find it to his advantage to do a certain amount of close

breeding, but boars of this description are not numerous, and it is seldom that we are fortunate enough to secure one. Mr. Gentry secured such a boar in Longfellow, and recognized the boar's merit, but Longfellows are scarce. We might think we had a second Longfellow, but an attempt to concentrate his blood by inbreeding might prove the utter ruin of the herd, because the boar might possess weaknesses which did not become apparent until his progeny were inbred.

Cross-Breeding. Cross-breeding means the mating of animals belonging to different breeds, and implies that both male and female are pure-bred. Though a good deal of cross-breeding is practiced, very little systematic work has been done in the way of studying the relative merits of pure-bred and cross-bred hogs, nor the best way of crossing to obtain a given result.

Some work in cross-breeding at the Ontario Agricultural College gave indefinite results, so far as cheapness or rapidity of gain was concerned, there being nothing to indicate that one method of crossing necessarily gave better results than another, or that cross-bred pigs were necessarily better than pure-breds.

J. H. Grisdale, Central Experimental Farm, Canada, reports cheaper gains from cross-breds than from pure-breds, but he failed to find that any one method of crossing was superior to another, so far as his work went.

The writer's experience leads him to believe that the progeny of animals which have become too fine and lack growth and thrift, can be much improved as profitable feeders by the introduction of the blood of a more growthy and heavier boned type; or that animals that are coarse-boned, or slow feeders, can be improved by using the blood of a finer type. Frequently, however, this result can be attained without resorting to cross-breeding, but by selecting types within the same breed. In the case of thrifty, rugged pure-breds, which are of a type which meets the requirements of the feeder, it is difficult to see how any advantage is to be derived from cross-breeding.

In mating extreme types, it is probably safer to use a roomy, growthy type of female, because such sows are generally more prolific and better mothers than a very fine, compact type of sow. The roomy sow, mated with a compact type of boar, will generally prove more profitable than a fine sow mated with a coarse boar. The progeny will be similar in both cases, but are likely to be more numerous and better nourished from the roomy type of sow. In these matters, however, a man must work according to the material he has at hand, and he may find it necessary to cross in the opposite way from that recommended here.

Grade Breeding. A grade animal may be defined as one whose parents are not both pure-bred. One parent may be a pure-bred and the other not, or neither parent may be a pure-bred. Generally speaking, the more crosses of pure blood an animal possesses, the better animal it is, and there are grades which carry so many crosses of pure blood that they are essentially pure-breds in everything but name. For producing market hogs, that is hogs for fattening purposes, a good grade sow may answer just as well as a pure-bred, provided she is mated with a good boar, and a large proportion of market hogs are produced in this way.

Pedigree and Heredity. A good many people are inclined to look upon pedigree as something distinct from utility. Nothing could be further from the truth. The question is frequently asked: "Which is of greater importance, individuality or pedigree?" The question does not admit of a definite answer, for neither is complete without the other; that is to say, the desirable breeding animal should possess individual merit as well as a good pedigree. The reason we value pedigree is because we believe in heredity. The pedigree tells us the names of the ancestors of the animal in question, and we believe that the ancestors of an individual have an influence in determining the character of the progeny of the individual. Therefore, if we find in the pedigree of a certain animal the names of a considerable number of animals known to possess a high degree of merit, and if the animal under consideration is a reasonably good representative of the breed, we would feel fairly safe in breeding from such an individual. We would say that such an animal had a good pedigree, because it comes of a good line of ancestors. If, however, we found an animal that was quite satisfactory as an individual, but the pedigree showed us names of ancestors which we knew possessed very undesirable qualities, we would hesitate to select such an animal to put into our herd, especially if it were a boar, because we would be afraid that some of those undesirable qualities might crop out in the progeny and be spread throughout the whole herd. We might even go so far as to select a boar not quite equal as an individual to the one just described, but possessing a good pedigree. It would not be advisable, however, to breed from a really bad individual merely because he had a good pedigree, because there are many animals with good pedigrees which should never be used for breeding. It is just here where experience is necessary to enable a breeder to hold the balance properly between individuality and pedigree. It may be added that a tabulated pedigree means nothing to the man who does not know anything about the animals whose names appear therein, and the man who would become a breeder must make it his business to familiarize himself with the great sires and families which have attained to eminence in the breed he is

handling. It must be remembered, also, that the immediate ancestors, such as the sire, dam, grandsire, and granddam, are likely to have a greater influence for good or evil than more remote ancestors, and therefore, the first two or three generations, or, in other words, the top crosses, should receive special attention in studying pedigree. The more remote the ancestor, the less important is its influence likely to be.

Selection of the Boar. In these days, when pure-bred males are plentiful and reasonable in price, there is practically no excuse for using anything but a pure-bred boar, even though the sows may be merely grades. The pure-bred male will transmit his own qualities to his progeny with greater certainty than a grade of cross-bred, and will get pigs of more uniform quality and excellence, so that it pays to use a pure-bred boar even for producing market hogs. It is true that many pure-bred boars should not be used for breeding, but this affords no reason for using a grade boar. The "scrub" pure-bred should be rejected along with the grade and the cross-bred, and there are reasonably good pure-bred boars always available to the man who will make an effort to get one.

When selecting a boar to head a pure-bred herd, it will not do to be too economical in regard to price. This does not mean that we are to pay fancy prices, running into the thousands, such as we sometimes read about, but it is well to bear in mind that a boar which is not good enough to command a fair price, is seldom good enough to put at the head of a pure-bred herd. The importance of the herd will determine the price which the owner can afford to pay for a boar, but a few extra dollars on the price of a boar is a small matter when it is the means of securing something that the breeder really needs. The mere size of the price, however, is not a safe criterion of the merit of the boar, but it rests with the man who makes the selection to see that he gets value for his money. It is right here where a wide experience and a seasoned judgment count for so much in stock breeding. Sometimes aged boars, which have proved their excellence as stock getters, are to be had at a very reasonable price, and if they are still active, they are much safer to buy than young, untried boars. There is much unreasonable prejudice against aged boars, and many an excellent aged boar is sent to the butcher long before his usefulness is past, merely because no person would buy him for breeding purposes; and young boars, many of which should have gone to the butcher before being used at all, are taken in preference. These things are matters of judgment, and to select wisely the breeder must know what he requires.

The desirable conformation of the boar will depend upon whether he belongs to the fat type or the bacon type, and will also be influenced, more or less, by the breed to which he belongs. The

general type of the fat hog and the bacon hog is discussed in another place, but it may be said that we expect a boar to be stronger in the head and to possess a more muscular neck, more massive shoulders, and heavier bone, than a sow or barrow. He should conform to the best type of the breed to which he belongs, and should have a bold, impressive carriage and general appearance. There should be nothing effeminate about his appearance and general make-up. Coarseness and roughness are not desirable, but if it came to a choice between two boars, one of which was fine and effeminate, and the other inclining to coarseness but strongly masculine, the writer's experience would lead him to choose the latter, other things being equal.

Selection of the Sow. For the production of market hogs, it is not essential that a sow should be pure-bred. A grade sow of good type and parentage will usually produce very satisfactory pigs for market purposes, if mated with a boar of good breeding and quality, but, of course, none of her boar pigs should be kept for breeding purposes.

Whether pure-bred or grade, a sow selected for breeding should be from a prolific mother, and by a boar that comes of a prolific family, because fecundity is hereditary to a very high degree. It is safest to select a sow from a matured mother who has had a chance to demonstrate her usefulness. In making a selection, the number and character of the teats should be noted. A sow is more likely to make a good mother if she has at least twelve well developed teats, set well apart, and the front ones well forward on the body.

In character, the sow is directly the opposite of the boar, and there is a femininity about her general appearance and bearing, which indicates the prolific and indulgent mother.

When a really good sow is once obtained, she should be kept in the herd as long as she retains her usefulness. A really first class sow is not too easily obtained, and when once acquired, it will be found the part of wisdom to keep her as long as she continues to produce satisfactory litters.

TYPES OF SWINE.

There are two well defined types of hogs, which are the outcome of local conditions and market requirements, namely, the fat or lard type and the bacon type.

THE FAT OR LARD TYPE.

The fat or lard hog is the product of the "corn belt." Corn feeding has a tendency to produce fat at the expense of the muscle or lean meat, and corn is the principal hog food of the United States.

Most of the hogs of the United States are grown in the great corn producing states, and it is here we find the lard type in its highest degree of perfection.

The fat hog is characterized by a compact, thick, deep, smooth body, remarkable for its depth and thickness rather than its length. There should be a proportionate development of the different parts, and all parts should blend smoothly together, giving what is called compactness of form. The hams, back and shoulders are the most valuable parts from a market standpoint, and should be largely developed. The market hog should be fattened to a high degree, because lard is an important consideration with the packer, and a well fattened hog will dress a larger percentage of its live weight than one which is not well finished, which is another important point with the packer.

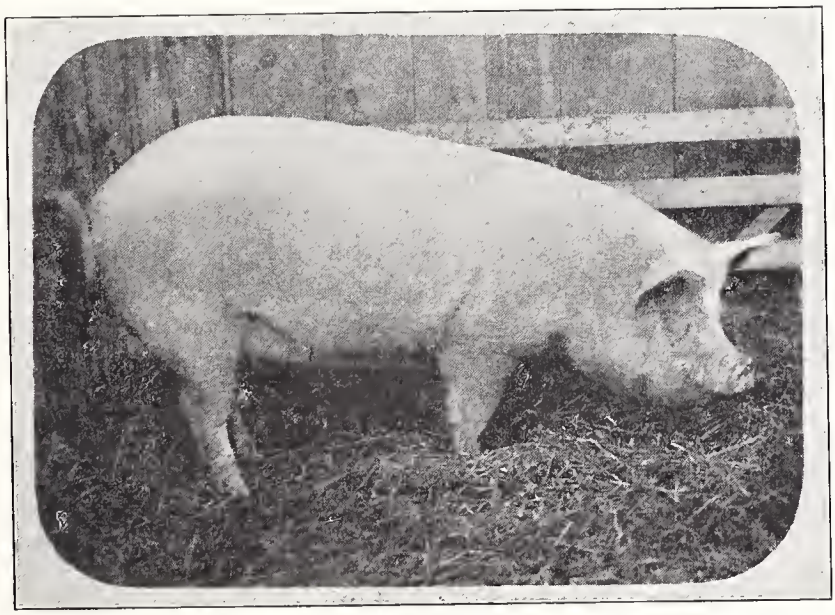


PLATE 1.

First prize and champion Chester White barrow at the International Livestock Exposition, Chicago, 1904, exhibited by the Iowa Agricultural College, Ames, Iowa. This hog illustrates almost the extreme fat type.

Quality is denoted by fine hair, smooth, clear skin, rather fine, clean bone, and even distribution of flesh. There should be no wrinkles in the skin, the jowl should be broad, plump and full but not flabby, and the belly should be reasonably trim, that is, not sagging or baggy in appearance. In breeding animals, some allowance would have to be made for sows which had produced several litters of pigs.

The animal should be able to walk off freely, without apparent effort, and the pasterns should be short and upright.

The snout should be moderately fine, the face wide between the eyes and the poll wide and full. Width between the eyes and fullness

of poll denote a good feeder. The eye should be full, bright, and of good size, and there should be an absence of creases and folds of fat about the eyes. The size and shape of the ear varies in different breeds, but it should be fine, soft, and generally somewhat small. The jowl should be full, broad, deep, smooth and firm, carrying its fullness well back toward the point of the shoulder. The neck should be short and deep, and should blend smoothly into the shoulder at all parts.

The shoulder of the fat hog has considerable market value, and hence should be largely developed. It should be broad, deep, and smooth; compact on top, blending smoothly into the body, and being well covered with flesh over all its parts. The breast should be wide, deep, and full, denoting constitution, and the fore-legs should be set well apart, short, tapering, and straight. The pasterns should be upright. the bone rather fine, and clean cut in appearance, and the feet strongly formed.

Along the region of the back and loin lie some of the most valuable cuts, and, therefore, large development is asked for in this region. The back should be broad, straight, or very slightly arched, medium length, uniform width from shoulder to ham, thickly fleshed, even and smooth, without creases or lumps. The loins should be broad, strong, full and thickly and smoothly fleshed. The ribs should be well sprung and the side deep, smooth, and even between shoulder and ham. The heart-girth should be large, the animal being full back of the shoulder, and deep and full at the fore flanks. The hind flank should also be deep and full.

The ham is another important consideration from a packer's standpoint. It should be broad, deep, plump, smoothly and heavily fleshed, with the flesh carried well down towards the hock on the inside as well as at the rear. The rump should be the same width as the back, long, smooth, and slightly rounded from the loin to the base of the tail. The hind legs should be short, straight, set well apart and squarely under the body, with bone, pasterns, and feet as described under the fore-legs.

The above description gives a fairly clear impression of the general type of the lard hog, a hog which admirably meets the requirements of feeders in the corn belt, and which plays an important part in the exports of the country. But, in addition to the demand for the products of the lard hog, there is an important demand, both at home and abroad, for a leaner class of meat. In some of the large cities of England this demand has taken a definite form, and what is known as the "Wiltshire side" is especially designed to meet this demand. A hog suitable for manufacturing into "Wiltshire sides" is known as a "bacon hog," and breeding stock of a type suitable for producing bacon hogs is said to possess bacon type. Bacon hogs cannot be produced successfully under a system of corn feeding.

and hence we find the bacon hog produced in greater numbers in countries where the food of the hog is more varied in character, and where the conditions are less favorable for producing the lard hog than they are in the United States. The countries sending the greatest number of Wiltshire sides to Great Britain are Denmark, Canada and Ireland. Generally speaking, hogs cannot be grown so cheaply in Canada and Denmark as they can in the United States, particularly in the corn belt; but, on the other hand, Wiltshire sides usually command a higher price per pound in England than the meat of the lard hog. This higher price for finished product affords some protection to the swine industry in Canada and Denmark, and it was to escape direct competition with the American product in Great Britian that Canada and Denmark engaged in the manufacture of Wiltshire sides. Such an arrangement seems to be the part of wisdom, each country devoting its attention to the type of hog which it can produce to best advantage. This brings us to a consideration of the bacon type more in detail.

THE BACON TYPE.

To produce a good Wiltshire side of bacon requires a hog of certain definite peculiarities as to weight, condition and conformation. The customers for this class of bacon are extremely fastidious, and if the bacon does not come up to the standard in every particular, it is very heavily discounted in price. As a rule, the weight limits are usually fixed at 160 pounds to 200 pounds live weight. It is true that a hog may weigh slightly more than 200 pounds and still make a very good Wiltshire side, but most hogs are inclined to be too fat after they pass the 200-pound mark, and consequently this is fixed as the limit, though it is not strictly adhered to. As to condition, it is possible to have the hog too thin or too fat. When the carcass is split down the back, the layer of fat along the back should run from an inch to an inch and a half in thickness, and should be as uniform in thickness as possible from the loin to the neck. The most valuable meat in a Wiltshire side is the upper part of the side from the ham to the back of the shoulder, including the upper corner of the gammon or ham, the loin, and the upper half of the ribs. The lower part of ham, and the flank and belly meat are not worth as much per pound as the upper portions, and the shoulder and neck are comparatively cheap parts.

In form, the bacon type of hog is very different from the lard type. It is longer in the leg and body, has less thickness and depth of body, and is lighter in the shoulder, neck and jowl. The hog should be long from the back of the shoulder to the ham, but comparatively short from the back of the shoulder to the snout. Along with length, however, the hog must have sufficient depth and thickness to denote constitution. No matter how long in body it may be, if it has long,

coarse legs, and a narrow, cramped chest, it is an undesirable type to breed from. A trim belly is desirable, because the belly meat is cheaper than the upper part of the side. In judging sows that have produced several litters of pigs, some allowance must be made in this connection.

A fine, smooth coat of hair denotes thriftiness and good quality of flesh. Wrinkles on the skin, if at all marked, indicate coarse-grained flesh. Softness or flabbiness of flesh denotes too much fat in proportion to lean. There is a marked difference between the handling qualities of a finished bacon hog and a finished lard hog,

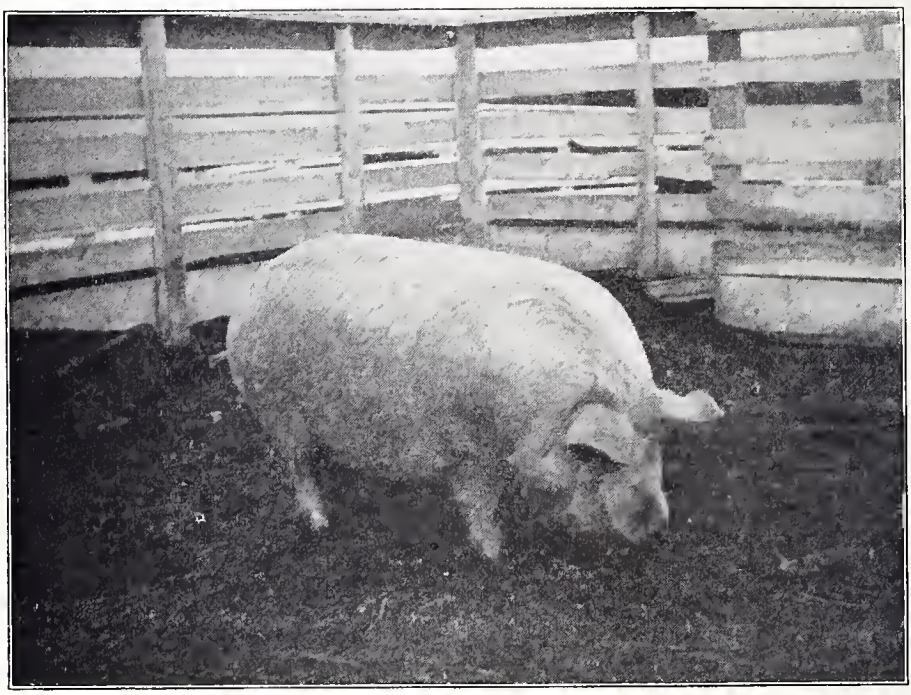


PLATE 2.

Young Larke Yorkshire sow, bred by J. E. Brethour, Burford, Ont. This sow furnishes a good example of bacon type.

the former being much firmer to the touch. The bacon type of hog has heavier bone than the fat or lard type, but very coarse, puffy looking bone denotes poor quality of flesh and is often associated with poor feeding qualities. Though the bone is fairly heavy, the legs should present a clean-cut appearance.

The jowl has very little market value. A heavy jowl denotes tendency to put on too much fat. Good width of jowl is desirable from a feeder's standpoint, but it should be very trim and neat.

A long, scrawny neck indicates weak constitution and slow feeding qualities. On the other hand, a short, thick neck with an arch, or crest of fat on top, such as is commanded in the fat hog, will cause the side of bacon to be heavy at the shoulder and neck end, and this is the cheap end of a side of bacon. The neck should be of only medium length, and should possess no tendency to arch on top.

The shoulder of the bacon hog is somewhat upright, making the animal comparatively short from the back of the shoulder to the snout, but long from the back of the shoulder to the rump. The shoulder is a cheap part, and, therefore, should be rather light. It should be very compact over the top, should be no wider than the back, and should blend smoothly into the body at all points.

The back carries the most valuable meat, but it should not be wide, because a wide back invariably carries too much fat for a Wiltshire side. It should possess medium width, and should carry its width evenly throughout. The top-line should be slightly arched, the highest point being over the loin.

The loin is the most valuable cut in a Wiltshire side, and should be as wide as the rest of the back, full, strong, and well packed with flesh.

The spring of rib of a bacon hog is very characteristic. It should spring out boldly from the back bone, then turn sharply and drop in an almost vertical direction, giving a flat, straight side.

From a packer's standpoint, a bacon hog cannot have too long a side, but the breeder must exercise care that he does not secure this extreme length at the expense of constitution. It is well to avoid extremes of all kinds. It is absolutely necessary, however, that the hog should have good length of side, much more than is found in the fat type.

The rump affords a valuable cut, but a flat, broad rump indicates the presence of too much fat. The rump should be the same width as the back, should be very smooth, and slightly rounded from side to side over the top.

Great, broad, bulging hams are not wanted on the bacon hog. Such hams carry too much fat, and require severe trimming in preparing the side of bacon for market. The ham of the bacon hog is smooth and firm, and tapers towards the hock. The flesh should be carried well around the bone, leaving no bareness of bone on the inside of the thigh.

MARKETS.

The hog market of the United States is extremely complicated, local conditions and demands rendering it difficult to present the subject in anything like a clear and concise form. The subject is one of such importance, however, that it is felt that an attempt should be made to explain some of its principal features.

In the smaller packing-houses, east of Chicago, the hogs are not so finely grained, nor so systematically cut into standard cuts as they are in the great markets of Chicago, St. Louis, Kansas City, St. Joseph and Omaha. The method of grading live hogs in the large markets does not materially differ, and the Chicago market may be

regarded as typical of the American hog and provision trade. If we read Chicago market reports, we find the following classification of live hogs:

Choice to prime heavy.
Medium to good heavy.
Butcher weights.
Good to prime mixed.
Rough heavy packing.
Poor to prime pigs.
Straight to heavy packing.
Selected bacons.
Stags.
Boars.

"Prime" refers to the degree of finish and maturity evinced by the hog. To grade as prime, a hog must be highly finished and give evidence of being fitted to a high degree of perfection. In other

PLATE 3.

"Prime medium butchers," weight, 220-280 pounds, very smooth and highly finished. "Light butchers" are of the same general type but lighter weight, 180-220 pounds. Butcher hogs comprise about 25 per cent. of the hogs coming to the Chicago market, and are commonly used for the fresh meat trade. Prime butcher hogs, whether heavy, medium, or light, represent the highest quality of fat hog. (Courtesy Illinois Agricultural Experiment Station.)

words, prime hogs are those which fully come up to the highest standard of the class to which they belong. Choice hogs are scarcely equal to prime hogs, and good hogs stand a little lower still than the choice. "Medium" sometimes refers to weight alone, and sometimes includes quality as well. Many market terms are purely local in significance, and hence are difficult to define. "Common" represents a still lower grade, and "poor" and "rough" the least desirable grades.

What are known as "heavy" hogs may range in weight from 350 to 500 pounds. They are not so numerous as they were some years ago, but they still constitute quite an important feature of

the market. Though the general trend of the market is towards lighter weights, it not infrequently happens that prime heavy hogs command a premium over other sorts, especially when the lard market is strong. "Clear backs" and "clear bellies," which are entirely composed of fat, come from this class of hogs, though it is difficult to establish any definite relation between the live hog and its product, owing to the fact that the packer must shape his course largely to suit market demands, and these vary from time to time.

"Butcher" hogs may vary in weight from 180 to 350 pounds. This class may be sub-divided, as follows: Heavy butchers, 280 to 350 pounds; Medium butchers, 220 to 280 pounds; Light butchers, 180 to 220 pounds. The heavy butchers are also graded into "prime"

PLATE 4.

"Prime heavy hogs," weight 350-500 pounds, the extreme of the fat or lard type. At one time these hogs were much more numerous on American markets than they are to-day, the decrease being due to the decreasing demand for fat pork. (Courtesy Illinois Agricultural Experiment Station.)

and "good," and the medium and light butchers each into "prime," "good" and "common." The Chicago market report given above has lumped all the butcher hogs together. Butcher hogs are principally barrows, and are commonly used for the fresh meat trade, though they may be variously used, according to the peculiarities of the market.

"Packing" hogs are not equal in quality to "butcher" hogs. Old brood sows that have been well fattened, find their way into this class, as well as all hogs that have not the requisite quality and finish for the "butcher" or "prime heavy" classes, but have sufficient weight and finish to qualify for the purpose for which packing hogs are used.

The meat from packing hogs is cured and packed in barrels or boxes, hence the name of the class, as well as the name of the industry. Packing hogs are usually graded as "Heavy," "Medium" and "Mixed." Heavy packing hogs weigh from 300 to 500 pounds, and medium packing from 250 to 300 pounds. "Mixed packing" is a term applied to hogs which are marketed without grading, and the class may contain representatives of almost all classes, packing hogs, of course, predominating. Generally, they sell at a slight discount as compared with properly classified and graded hogs, and frequently they are bought by speculators in the stock yards, who buy large numbers divide them up into their proper classes and grades, and re-sell them. "Rough" packing hogs are coarse, and lacking in condition.

"Pigs" are light hogs, weighing from 60 to 125 pounds. They are young, as their weights indicate, and their meat is unsuitable for curing. They supply a demand for cheap, fresh meat.

Bacon hogs, as quoted in Chicago, are not suitable for making Wiltshire sides. They are merely selected light hogs, weighing from 155 to 195 pounds. They are of the same breeds that produce the lard type, but they are young, from six to eight months, and have not been fattened to the highest degree. They are used principally for supplying the home demand for comparatively lean meat. A hog suitable for making Wiltshire sides is usually classed as an "English bacon hog," since the Wiltshire side is especially adapted to the English trade. The St. Paul market is about the only American market which gives prominence to the English bacon hog.

Stags are males which have been castrated too late in life to grade as barrows. The smoothest of them may go into the packing class, the roughest with the boars, and various uses are found for intermediate sorts. They are docked 80 pounds in selling, so that the quoted market price is higher than the seller actually receives.

The meat from boars is used largely for sausages and also helps to supply the demand for cheap meat.

Generally speaking, it may be said that the tendency of the American market during the past ten years has been towards a lighter and leaner hog. The most desirable weight for butcher and packing hogs is 250 pounds, though, as previously stated, there are times when heavy hogs command a premium. It is also worthy of note that "butcher" hogs represent the best market hogs of the fat or lard type.

The market for live hogs is somewhat complicated, but the market for hog products is very much more complicated than the former. The speculative provision market quotes only "pork," "ribs," and "lard." These are the only pork products traded in on the Board of Trade in the way of options, and, to a certain extent, they govern the prices of other pork products.

"Pork" refers to Standard Mess Pork, which is made from the sides of well fattened hogs. The hams and shoulders are removed, and the sides are cut into strips about six inches wide. These pieces are packed in barrels with salt and brine, the number of pieces to a barrel varying from seven to sixteen. Barrel pork is quoted on the market on the basis of 200 pounds net to the barrel.

There are other classes of barrel pork, such as Prime Mess Pork, in which the shoulder is included with the side; Extra Prime Pork, and Extra Shoulder Pork, taken from the shoulders alone, and numerous other kinds which it would be scarcely profitable to describe, because each packer has his own methods of cutting pork, outside of certain standard products.

"Ribs," or short rib sides, are cut from the sides, leaving out hams and shoulders in the same way as standard mess pork. These are dry salted and packed in boxes containing 500 to 525 pounds net, or shipped loose in the car, salted.

Lard is usually divided into two grades, namely, "Choice Lard" and "Prime Steam Lard." The Chicago Board of Trade regulations state: "Choice lard to be made from leaf and trimmings only, either steam or kettle rendered, the manner of rendering to be branded on the tierce." The same regulations state: "Standard prime steam lard should be solely the product of the trimmings and other fat parts of hogs." This permits the intestinal fat, or fat from any other parts to be used in the manufacture of prime steam lard, whereas choice lard is made from the leaf and trimmings only. Market quotations are based upon choice lard.

Mess pork and short ribs are no longer popular cuts, and are only made at a time when there is a surplus of hogs above the number required for the fresh meat trade, or when, owing to speculative conditions, the market price of these products is relatively higher than the price of fresh pork cuts.

The "Wiltshire side" constitutes the main export product of Canada and Denmark, but has never attained any great importance in the United States. It is especially designed to meet the requirements of a certain class of English consumers. A Wiltshire side consists of the whole side of the hog, less the head and feet. The blade bone of the shoulder, the neck bone, and the aitch bone are removed, the top of the ribs sawed off, and the side trimmed as smoothly as possible. The sides are mild cured, and shipped to England in the green state, where they are smoked before they reach the consumer. The type and weight of hogs suitable for this purpose have already been described.

One of the greatest drawbacks to the trade in Wiltshire sides is the fact that the meat has to be mild cured, and, therefore, must be consumed within a very short time, or it will go off flavor. The

result is that it is impossible to hold over Wiltshire sides when there happens to be an extra amount thrown upon the market at one time, and prices often suffer severely through this cause.

Generally speaking it may be said that the consumption of ham and bacon is steadily on the increase, and large quantities of these products are taken by Great Britain, Mexico, Cuba, Porto Rico, and the Philippines. Norway, Sweden and Italy take very heavy, fat meats, but the bulk of other standard cuts and products outside of those already mentioned, are taken for home consumption.

This discussion of markets is anything but exhaustive. To attempt a description of markets of all the many classes of products placed upon the market by different packers would probably only tend to confuse the reader, and all that has been attempted is to present, as briefly as possible, some of the leading features of the trade.

BREEDS OF SWINE.

BERKSHIRE.

Description. The Berkshire is an attractive animal in appearance, and is rather above medium size, though, as a breed, it scarcely equals the Yorkshire and Tamworth in size. The face is moderately dished, the snout medium in length, the jowl full and rather heavy, and the neck short, with considerable crest. The ears should be firmly attached to the head, and are usually erect, though they frequently incline forward in aged animals. The breed generally has good width of shoulder, a broad back resulting from a well sprung rib, and good thickness through the rump and hams. The Berkshire is noted for a thickly meated, trim ham. In general, it has good depth of body; and should possess a deep, wide chest, with a full heart-girth. In the best representatives of the breed, the bone is all that could be desired, being strong and clean, and the animal generally stands well on its feet. The standard color is black, with white markings in the face, on each foot, and on the tip of the tail. A small splash of white on the arm is not objected to, but when on the jowl, shoulder, or other part of the body, it becomes an objection in the eyes of most breeders. Occasionally, some of the standard white markings are missing, such as the white on the tip of the tail, on one or more of the feet, or the white mark on the face, and the absence of any of these markings would also constitute an objection. The standard of excellence of the American Berkshire Asso

ciation says nothing about disqualifying an animal for defective markings, so that each breeder must be his own judge as to how much latitude to allow in the matter of markings. Unless the markings are glaringly defective, it would not seem to be the part of wisdom to reject an animal that was really first-class in other respects.

Origin and History. Berkshires derive their name from Berkshire in England, though the breed is now to be found in all parts of the British Isles. Very little is known regarding the origin of the original Berkshire, but the breed was very different from the Berkshire of to-day. The old Berkshire was very much coarser than the present type, had lopped ears, and its color was commonly a

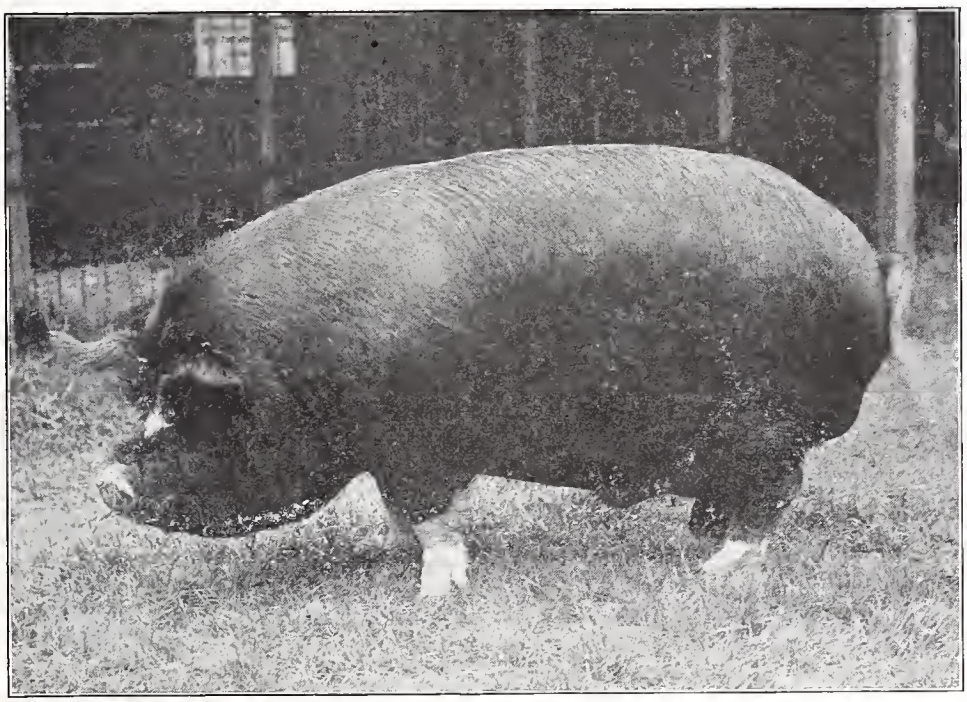


PLATE 5.

Berkshire boar, "Peel Champion," winner of first prize and championship at the English Royal Show, 1905. Exhibited by J. Jefferson, Chester, England. (Courtesy Wm. Cooper & Nephews, Berkhamsted, Eng.)

sandy, or reddish brown, spotted with black, or white with black spots. It had a reputation of producing a good quality of meat.

It is claimed by some that improvement was effected by using black Siamese boars on the original Berkshire sows, and others claim that black and white Chinese boars were used. Mr. A. B. Allen, who bred Siamese swine many years ago, describes the breed as follows:

"They varied in color from deep, rich plum to dark slate and black; had two to three white feet, but no white on the legs or other parts of the body. The head was short and fine, with a dished face and rather thin jowl; ears short, slender, and erect; shoulders and hams round, smooth, and extra large; back broad and slightly arched; body of moderate length, deep, well ribbed up, and nearly as

round as a barrel; * * * legs fine and short; * * * hair soft, silky, and thin; no bristles, even on boars; * * flesh firm, sweet, and very tender, with less lean than the Berkshire."

A breed such as the one described was well qualified to improve a coarse breed like the old Berkshire. Mr. Allen favors the theory that Chinese blood was also used, and from his investigations in England, fixes the commencement of improvement in the Berkshire by crossing at some time previous to 1780.

Allen states that Berkshires were first imported to America in 1823 by John Brentnall of New Jersey. The next importation to Canada is said to have been made in 1838. F. D. Coburn states that for ten years subsequent to 1831, there was relative speculation

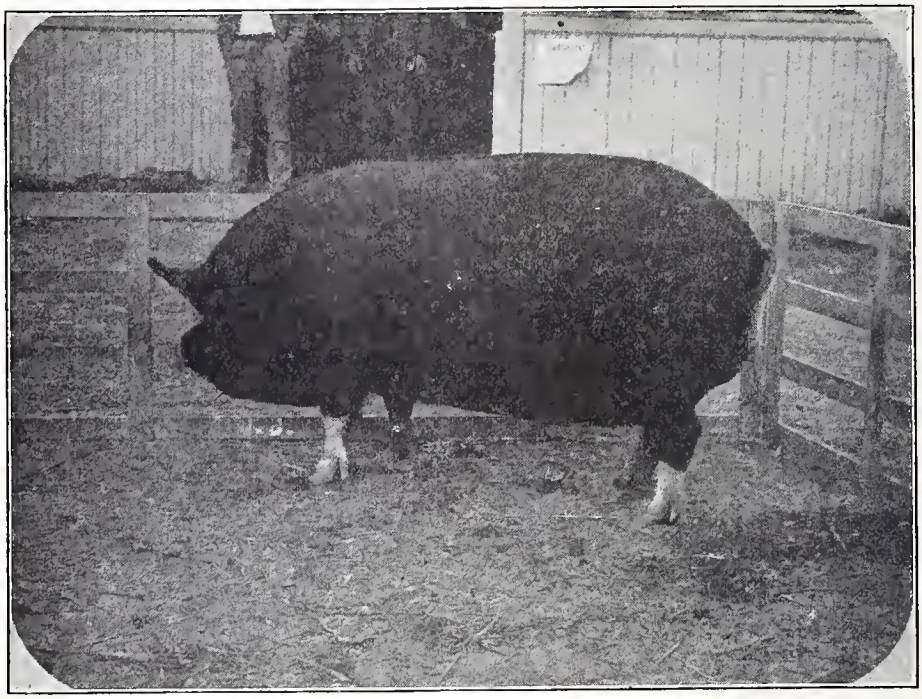


PLATE 6.

Yearling Berkshire sow, a Toronto prize winner. Bred by Wm. Wilson, Brampton, Ont. This sow represents the large, lengthy type of Berkshire.

in importing Berkshires and selling them at inflated prices, and that the methods employed by the speculators injured the popularity of the breed and retarded its progress. The real merit of the breed eventually overcame the prejudice which had been created, and to-day the breed is very popular in both the United States and Canada.

Berkshires are found in every state and territory of the United States, the most important centres being Illinois, Missouri, Indiana, Texas, Ohio, Kansas, Iowa, New York, Michigan, and Tennessee. They are found, also, in every Canadian province, Ontario taking the lead. They are distributed all over the British Isles, and have made their way into South America, Hawaii, and some European countries.

Types. Berkshires vary more or less in type, the type being influenced to a considerable extent by the demands of the market in the countries where they are bred, as well as by the methods of individual breeders. In the United States, it is only natural to expect them to conform to the fat or lard type, and some breeders have gone rather to the extreme in breeding for fine bone, smoothness, and quality, and neglecting size and fecundity. The best breeders, however, are succeeding in maintaining size and quality, and in producing a really useful animal.

In Canada, the tendency is to select for a lengthy, strong-boned type, which looks somewhat coarse and leggy when compared with the extremely fine type, but which is a first-class farmer's hog. The demand for the bacon type in Canada, and competition with the bacon breeds have an influence in bringing about this modification.

The so-called Large English Berkshire is not a distinct breed, nor is it necessarily a distinct family or branch of the breed. In England, as in any other country, the Berkshire will be found to vary more or less in type, and some importers select the larger, stronger-boned animals and import them under the name of Large English Berkshires. As a matter of fact, some of them may be litter mates of animals of the fine-boned type.

Utility. The Berkshire is better suited for supplying the market demand for fat hogs than it is for producing bacon hogs. Where backs, shoulders, and hams are the main requirements, the Berkshire fits in exceptionally well, but for the export bacon trade in "Wiltshire sides," it has scarcely enough length of side, and has too heavy a neck and shoulder. When crossed with the Large Yorkshire or Tamworth, an excellent farmer's hog is the result, though perhaps it is a little nearer the bacon type than the fat type. Berkshires have given a good account of themselves in the market classes of leading exhibitions where they have come into competition with other breeds.

In early maturity, Berkshires stand well, attaining good weights at an early age and fattening readily. Some would place the Poland China ahead of the Berkshire in point of early maturity, while others would place the Chester White or Duroc Jersey at the head of the list; but it is probable that among the best representatives of the breeds mentioned, there is not any very marked difference in point of early maturity.

The Berkshire ranks with the best as an economical producer of pork. Probably it will never be known which breed is capable of making the cheapest gains, but it is safe to say that the Berkshire will produce pork as cheaply as any other breed.

The flesh of the Berkshire is of excellent quality, and carries a large proportion of lean to fat. Investigations regarding the quality of meat from different breeds generally agree in giving the Berkshire a high place.

Berkshire sows of the more lengthy type are prolific, and generally make good mothers, but the extremely fine, short type of sow seldom produces such large litters. The boars are prepotent, and cross well with almost any other breed, as well as being useful for improving common stock.

POLAND CHINA.

Description. In size, the Poland China is generally ranked as medium, and, as a breed, it would probably hardly average up with the Berkshire in size, though it cannot be said that there is much difference between the two breeds in this point. The face is practically straight, and the jowl full and heavy. The ears should be fine

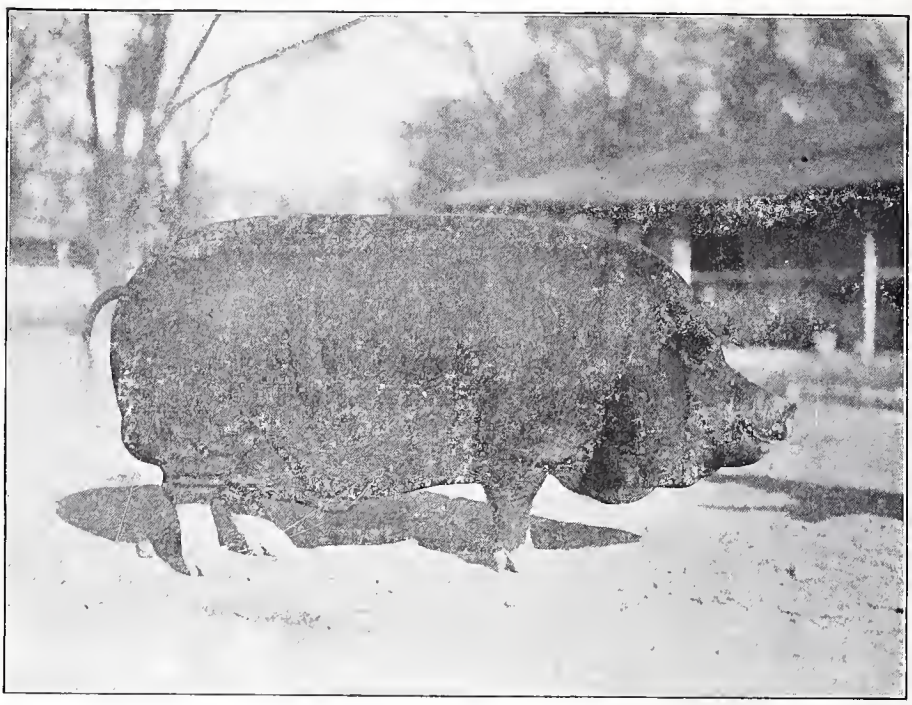


PLATE 7.

Yearling Poland China boar "Royal Dude." Winner of first prize and sweepstakes at St. Louis fair, 1903. Owned by E. M. Metzger, Fairfield, Iowa.

and firmly attached, with the tip drooped, the droop taking in about one-third of the length of the ear. Ears that are loosely attached and droop right from the point of attachment are seriously objected to. The shoulder is heavy, and the side, which is somewhat short, is very deep. The back is wide, and the top-line very slightly arched. The hind quarter is heavily fleshed, and the ham should be exceptionally wide and deep. As a rule, the legs are very short, and the bone fine—too fine in some cases. Years ago, Poland Chinas were freely marked with white, but the fashionable color to-day is practically the same as that of the Berkshire, namely, black with white on face, feet, and tip of tail. A limited number of small white markings on other parts are not seriously objected to.

Origin and History. The Poland China originated in Butler and Warren counties in Ohio. The Great Miami and Little Miami rivers drain the two counties mentioned, and the Miami valley is a very fertile district. The exact origin of the breed is not altogether clear, and lengthy controversies have occurred regarding certain points connected therewith. It is out of the question to discuss the various theories which have been put forth, and the following brief summary of matters pertaining to the origin of the breed may be regarded as reasonably accurate.

Previous to 1816, the Russia and Byfield breeds were used extensively for crossing upon the common hogs of the Miami Valley.

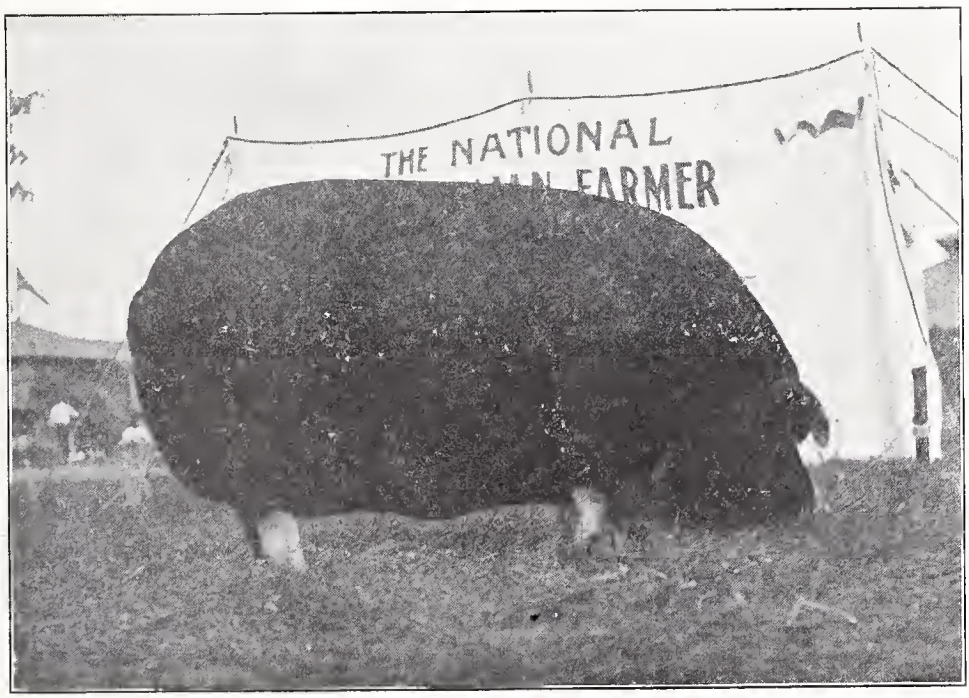


PLATE 8.

Poland China sow, "Miss Davis," winner of first prize at Ohio State Fair, 1905, and reserve champion at Louisiana Purchase Exposition, St. Louis, 1904. A sow of remarkable excellence. Owned by Chas. E. Keller, Newark, Ohio. (Courtesy Prof. C. S. Plumb, Columbus, Ohio.)

These were both white breeds possessing more or less merit as feeders. In 1816 the Society of Shakers of Union Village, Warren county, brought a boar and three sows from Philadelphia. The pigs were represented to the Shakers as being of pure Chinese blood, and they were called Big Chinas. The boar and two of the sows are said to have been pure white, and the other sow was white with some sandy and black spots. These Big Chinas and their descendants were crossed freely upon the hogs then in the county, and the resulting type came to be known as the Warren county hog. The Big China was a medium sized breed with fine bone and good feeding qualities, and its use upon the hogs of Warren county effected a marked im-

provement. It is also stated that following the introduction of the Big China, other Chinese hogs of smaller and finer type were brought into the county.

In 1835 or 1836, Berkshires were introduced and used quite extensively, and about 1839 or 1840 the Irish Grazier was imported and crossed upon these pigs of complicated breeding in Warren county. The Irish Grazier was a white breed of considerable merit, and did its share towards modifying Miami Valley hogs.

It was claimed by some that a Poland breed was used for crossing upon Warren county hogs, while others claimed that no such breed was ever introduced, and an extended controversy ensued, which ended in the appointment of an investigating committee, which reported its findings to the National Swine Breeders' Convention held in Indianapolis in 1872. The committee reported against the theory that a Poland breed had been used, but recommended that the name Poland China be recognized as the accepted name of the breed. The recommendation was adopted, and since that time the breed, which previously had been known by a great variety of names, has been known as the Poland China. It is claimed that no outside blood has been infused into this breed since 1845.

The Poland China is widely distributed over the United States. The principal states for the breed, according to the secretary of the American Poland China Record Association, are Iowa, Illinois, Texas, Missouri, Kansas, Nebraska, Indiana, Ohio, Minnesota, South Dakota, Wisconsin, Oklahoma and Michigan, but there are few states where Poland Chinas are not to be found.

Though represented in Canada, the breed has not yet obtained a strong foothold in that country, and outside of the United States and Canada, the breed is but little known.

Types.—The older type of Poland China was a larger, more rangy, and heavier boned hog than the Poland Chinas seen in the show-rings of to-day. Breeders of Poland Chinas have rather gone to the extreme, on the whole, in the matter of selecting for fineness of bone, and the result, in many cases, is a hog that lacks somewhat in size and fecundity. At the present time, the advisability of developing more size and bone in the breed is being widely discussed in the public press, and thoughtful breeders will give the matter careful consideration. There is little doubt that the best breeders will succeed in maintaining quality without sacrificing utility, and that the overfine type will fall into disfavor with the general farmer.

Utility.—The Poland China has been developed especially to meet the market demand for a fat or lard hog. The heavy shoulder, wide back, and largely developed hams render it an exceptionally good yielder from the packer's standpoint.

A cross between the Poland China and the Berkshire, Duroc Jersey, or Chester White is generally highly esteemed, and many regard the cross-breds as superior to the pure-breds for feeding.

As to early maturity, or the ability to produce a finished fat carcass for the butcher at an early age, no breed excels the Poland China. It has been bred for early maturity for generations, and has acquired a high reputation in this regard.

The Poland China is a general favorite with corn-belt farmers. It has been developed upon corn-feeding, and will probably stand heavy corn feeding better than most other breeds. As a machine for turning corn into pork, it is hard to beat, and it is also a good grass hog.

The meat of the Poland China has been criticized freely for carrying too large a proportion of fat to lean, and there seems to be good ground for the criticism. In their efforts to bring the breed to its present stage of perfection as a feeder, breeders have overlooked the production of lean along with fat, but the breed seems to meet the demands of the American packer, and he is willing to pay top market price for it.

Since so much attention has been paid to the development of fine bone and a marked tendency to fatten in this breed, it is not surprising to fine it criticized as lacking in fecundity. Statistics appear to indicate that the Poland China is not up to the average of other well-known breeds in point of fecundity, the deficiency occurring mainly in the very fine-boned types. This point gives the breeder of Poland Chinas food for serious reflection.

Owing to its exceptional tendency to fatten, the Poland China is valuable for crossing upon hogs which lack this tendency, and it is a useful breed for improving the common stock of the country.

CHESTER WHITE.

Description.—At one time the Chester White was rated as the largest breed in the United States, but the tendency of modern breeding has been towards the production of a finer-boned, smoother, and smaller animal than the older type, and at present the Chester White is similar to the Poland China in size, though it is commonly claimed that it is a larger breed. The face is straight, and the snout is usually a little longer than that of the Poland China. It has a drooped ear, similar to that of the Poland China, but the droop, or break, is usually further from the tip. As a rule, too, the ear is somewhat heavier, and it is quite common for it to be somewhat loosely attached. In general conformation, the Chester White is similar to the Poland China, though the latter generally excels in depth and fulness of ham, and many Chester Whites are rather longer in the body than the Poland Chinas. The color is white, no black hair being admissable, though it is common for black or bluish spots

to occur on the skin. These spots do not indicate impurity of blood, but breeders aim to avoid them as much as possible, and if the spots are large or numerous, they constitute a serious objection. In many specimens, the hair has a tendency to be wavy, and in some cases it is almost curly.

Origin and History.—Most authorities recognize three sources of origin for Chester White swine, the history of which may be summarized as follows:

1. The original Chester White had its origin in Chester county, Pennsylvania, hence the name. Large, white pigs were common in Chester county many years ago. They were taken there by the

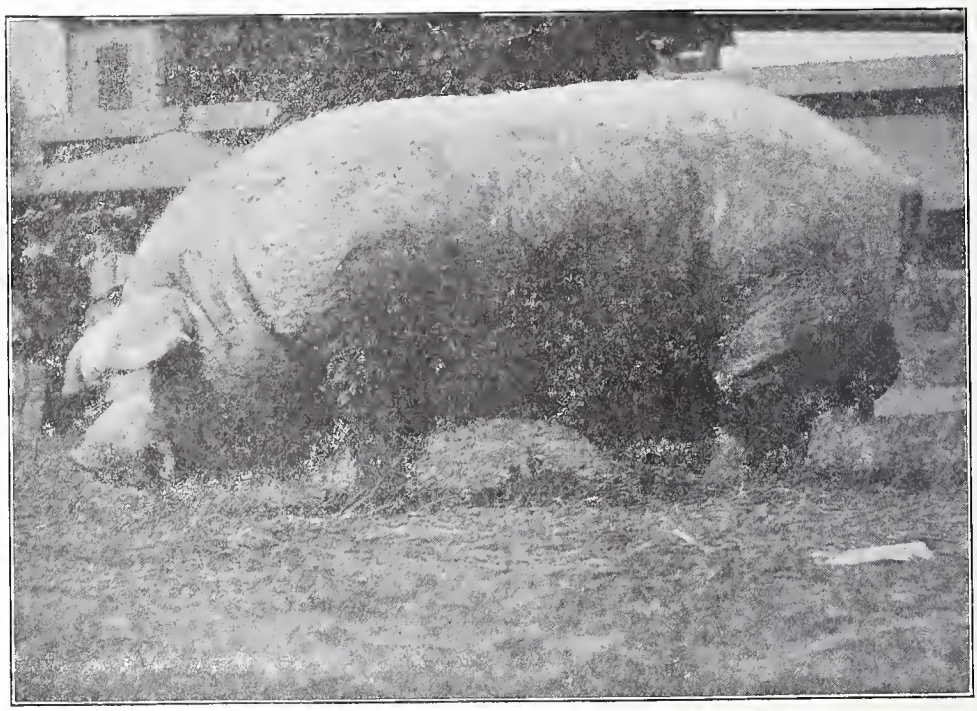


PLATE 9.

Aged Chester White boar, "Dexter," winner of many prizes, including first at Ohio State Fair, 1905. Owned by W. J. Cherry, Xenia, Ohio. (Courtesy Prof. C. S. Plumb, Columbus, Ohio.)

earlier settlers, but it is not clearly known where the original pigs came from. About the year 1818, Captain James Jeffries imported from England a pair of white pigs which are referred to by some as Bedfordshire pigs, and by others as Cumberland pigs. Captain Jeffries used the boar on the white sows of the district with good results. It is stated that at a later date, white Chinese pigs were brought into Chester county and crossed on the stock of the district. Eventually the different strains of blood were combined, and from this combination came the original Chester White breed.

2. The Improved Chester White, or Todd's Improved Chester White, can hardly be regarded as a distinct strain of the breed at present. At one time it had a herd record of its own, but in 1894

the articles of incorporation were changed to read American Chester White Record Association. Briefly, the history of the so-called Improved Chester White is as follows: About 1827, Norfolk Thin Rind pigs were imported from England to Connecticut. Two brothers, named Todd, brought a boar of this breed and a sow of what was called the Grass Breed, and took them to Ohio, where they were bred together with considerable success. Later, one Joseph Haskins brought to Ohio a boar of the Byfield breed, and a sow similar to the original Todd sow. The Todd and Haskin pigs were bred together, and Isaac Todd also used other boars in his herd, among which was one said to be of the Grass breed, and another one called a Normandy boar, though little is known of the breeding

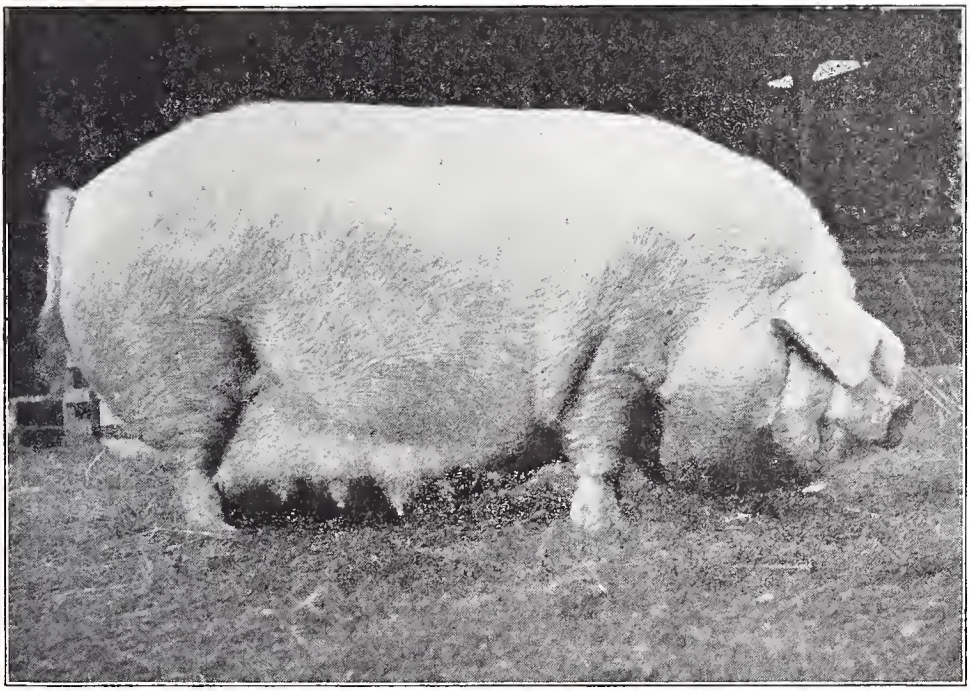


PLATE 10.

Three-year-old Chester White sow "Barget C.," winner of numerous prizes. Owned by W. J. Cherry, Xenia, Ohio. (Courtesy Prof. C. S. Plumb, Columbus, Ohio.)

of either of them. Both these boars were white in color. In 1865, Isaac Todd introduced Chester White blood, and his son, S. H. Todd, made further use of the Chester White, evolving, by careful breeding and selection, what came to be known as Todd's Improved Chester White.

3. The Ohio Improved Chester White, commonly known as the O. I. C. strain, is the product of the efforts of L. B. Silver of Ohio, who, in 1865, commenced breeding Chester Whites, and who aimed to produce a superior type through selection. This branch of the breed has an association and herd record of its own, but it would require a person more than ordinarily expert to distinguish animals

of this strain from other Chester Whites, as they appear at the various exhibitions.

The Chester White is widely distributed in the United States. It is popular in the East, and is strongly represented in Ohio, Illinois, Indiana, Iowa, Michigan, Wisconsin, Pennsylvania, and other states. It has also spread to the South to some extent, and seems to be giving satisfaction. It is also fairly well represented in Canada, where it has gained a stronger foothold than the Poland China.

Types.—The Chester White seems capable of showing more extreme variations of type than most other breeds. In the show-rings of the United States, the short-legged, fine-boned, smooth, medium-sized type seems to be preferred by most judges, who seem inclined to discourage the larger and heavier boned types. In Canada, more attention is paid to length, and some very lengthy, heavy-boned Chester Whites are met with sometimes in Canadian show-rings. In 1907, at the Ontario Provincial Winter Fair, held at Guelph, Canada, a pair of Chester White carcasses won sixth prize in the bacon carcass competition, where they had to compete with Yorkshires, Tamworths, and Berkshires. Though they did not make ideal carcasses from a bacon standpoint, quite a number of Yorkshire and Tamworth carcasses, together with all the Berkshire carcasses, were ranked below them. When it is known that the Guelph fair has the largest exhibit of bacon carcasses on the continent, it is easy to understand that these Chester Whites must have been about as different from the type of the American prize-winning Chester White as it was possible for them to be. This is an extreme case, but it illustrates the possibilities of the breed under different systems of selection and feeding.

Utility.—Though the Chester White can be made to approach the bacon type through selection and feeding, it seems like a waste of energy to attempt to make it a bacon breed, when first class bacon breeds are available already. The Chester White is best adapted to the requirements of the fat hog trade, and no doubt will continue as such. In Canada, it is frequently crossed with the Yorkshire and Tamworth, giving a very satisfactory feeder's hog. In the United States, a cross between the Chester White and Poland China is very popular. In fact, the breed crosses well with almost any other, and the Chester White boar is very effective in improving common stock.

The Chester White compares favorably with other breeds in early maturity, and as an economical producer of meat. It is also a good grazer, but, like other white breeds, is more or less subject to skin trouble when exposed to all kinds of weather. It produces a good quality of meat, which, however, is rather lacking in lean.

It is claimed that the Chester White, as a breed, is somewhat more prolific than the Poland China and the fine type of Berkshire, and the claim is supported by the findings of Dr. A. W. Bitting, who investigated the matter in 1897.

Description.—The Duroc Jersey is similar to the Chester White and Poland China in size, the tendency of modern methods of breeding being towards a medium sized hog with rather fine bone. The snout is of medium length, the face slightly dished or straight, and the ear drooped, much the same as that of the Chester White. The jowl is heavy, the body wide and deep, and the ham heavily fleshed. The legs are short, the bone medium in weight, and the body is noted more for thickness and depth than for length. Cherry red is the popular color, but yellowish red and chestnut are often seen. A few

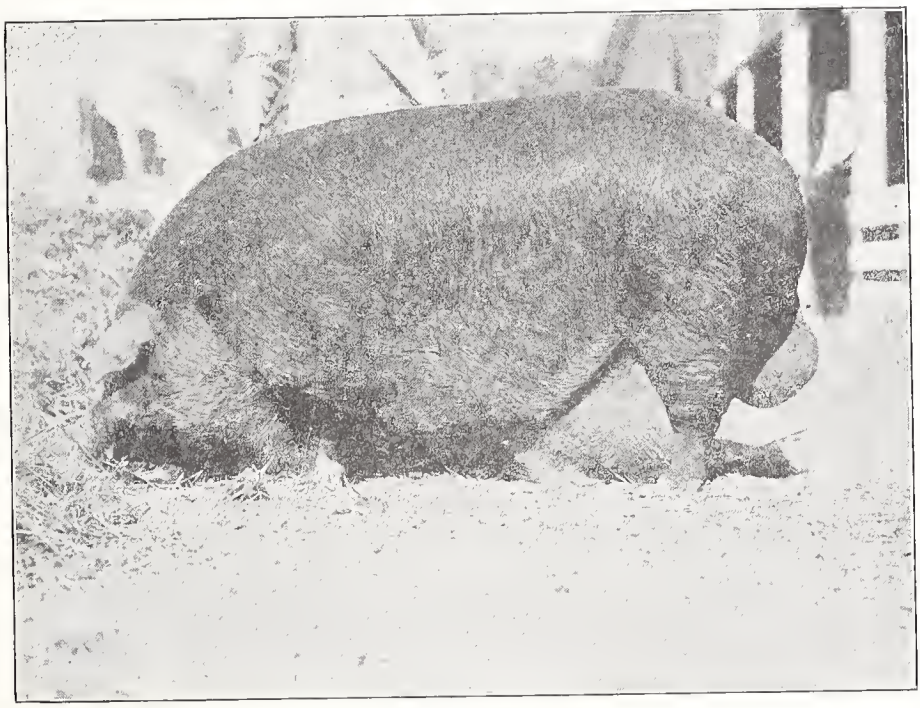


PLATE 11.

Three-year-old Duroc-Jersey boar, owned by Lowrance Bros., Taylorville, Illinois.

black spots on the belly and legs do not disqualify, but are objectionable. Black markings on any other part of the body are very serious objections.

Origin and History.—Red pigs have existed in the United States for a great many years, and there seems to be no satisfactory account of their origin. It is stated that slave traders brought in a red breed of hogs from Western Africa, known as the Guinea breed. Also, it is said that Henry Clay imported red pigs from Spain in 1837, and that Daniel Webster brought red pigs from Portugal in 1852. Further, it is claimed that the Berkshire, which was freely marked with red or sandy hair in early days, was a factor in the formation of some of the red varieties. Whatever their origin, a large, red breed of hogs attained to considerable prominence in New Jersey, and eventually became known as Jersey Reds. The Jersey Red was a

large breed with large, lopped ears, and good length of body. It was rather long in the leg and coarse in bone and hair, but was valued on account of its size, strong constitution and rapid growth.

The Duroc originated in Saratoga county, New York, and is said to be the result of crossing a red boar upon the sows of the district. It is uncertain whether the boar came from another part of New York State or from England. It is said that the boar was named "Duroc" after a famous stallion, and hence the name of the breed.

The breeders of Jersey Reds and Durocs eventually came together, and the two breeds were blended into one under the name of Duroc Jersey, the official amalgamation taking place in 1883.

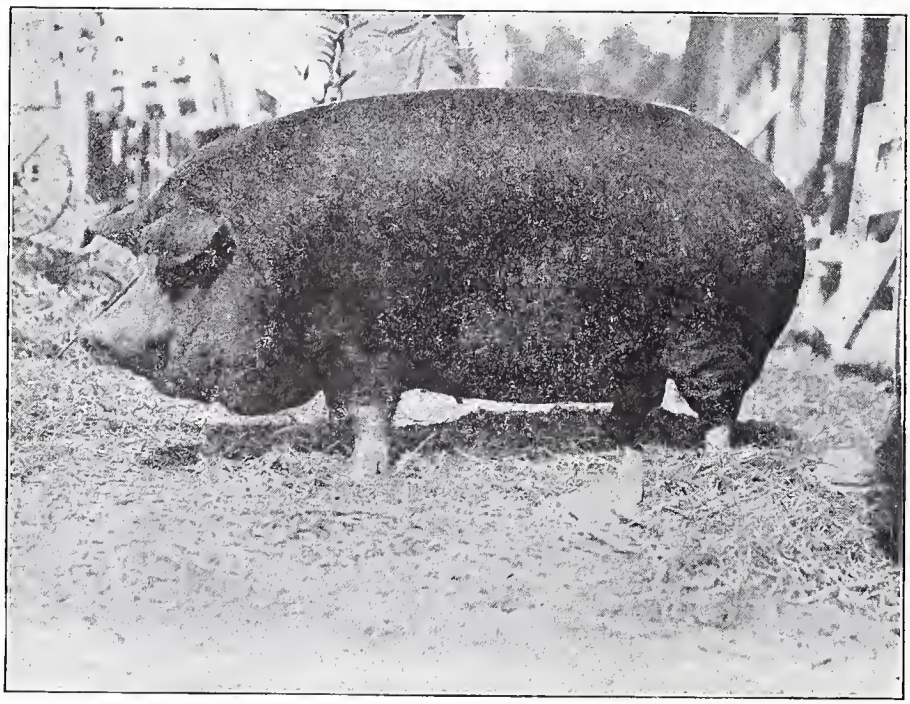


PLATE 12.

Two-year-old Duroc-Jersey sow, "Our Choice." Grand champion Illinois State Fair, 1905. Owned by Ira Jackson, West Milton, Ohio.

The most important centers for Duroc Jerseys are Iowa, Illinois, Nebraska, Kansas, Missouri, Indiana, Ohio, Minnesota, Oklahoma, Texas, Kentucky, Tennessee, Michigan and Wisconsin, but the breed is also quite largely represented in many other states. It has also been introduced into Canada, but is not largely represented.

Types.—Considerable variation is found in the type of Duroc Jerseys, as is also the case with other breeds. It is claimed by some, that breeders have gone too far in their efforts to produce a fine-boned, smooth animal, in that they have sacrificed too much of size and fecundity in doing so. Be this as it may, breeders are to be found who are producing hogs of more bone and greater size, and their hogs are attracting considerable attention among those interested in the breed.

Utility.—The Duroc Jersey is essentially of the fat or lard type, and it seems to be meeting the demands of the American packer in a satisfactory manner. It is an early maturing hog, and is capable of making cheap gains. In this respect, it is probably quite equal to other breeds. It has a good reputation as a grazer, and also thrives well upon a corn diet. It has an advantage over white breeds, in that its skin does not blister with the sun, a fact that is causing it to gain in favor in the South. Its meat is similar in quality to that of the Poland China and Chester White, when fed under similar conditions.

For a fat hog, the Duroc Jersey is prolific, and it crosses well with other breeds, especially the Berkshire and Poland China. As improvers of common stock, the boars bear a good reputation.

HAMPSHIRE (THIN RIND).

Description.—The Hampshire belongs to the class of medium-sized hogs. The face is straight, and the ear inclines forward but does not droop like that of the Poland China. The jowl, shoulder and ham are somewhat lighter than those of a typical fat hog. As a rule, too, it has less width of back, a little more length of side, and slightly less depth of side than a hog of the strictly fat class. The breed may be described as somewhere between the bacon type and the fat type in conformation.

Mr. H. F. Work, at one time secretary of the Breed Association, describes the color as follows: "In color, they are either listed or blacks, the most fashionable color consisting of black extremities with a white belt from four to twelve inches wide, encircling the body and including the fore legs, which should also be white." The term "listed" refers to the presence of the white belt. Mr. Work also states that there are some breeders who try to run their herds all black, and he claims that breeders should not be too particular regarding color, with the exception that white spots should not be tolerated.

Origin and History.—Originally, this breed was known by the name Thin Rind, but in 1904 the name was changed to Hampshire, which is now the official name of the breed.

According to Mr. Work, the Hampshire traces to pigs brought to Massachusetts from Hampshire, England, about 1820 or 1825. It is said that descendants of this importation were taken to Kentucky about 1835. In any case, the breed has been known in Kentucky for many years, but it seems impossible to obtain definite and reliable information regarding its origin.

According to the secretary of the American Hampshire Swine Record Association, the breed has made rapid progress of late years, but, in comparison with the older established breeds, the number in

any one state is not large, owing to the fact that the Hampshire has only recently come into prominence. In recent years, the breed has

PLATE 13.

Herd of Hampshire swine, winners of first prize at Louisiana Purchase Exposition, St. Louis, 1904. Bred by Jno. Goodwine, Jr., Potomac, Illinois.

found its way into Canada, but it has not had time to become widely distributed in Canada as yet.

Types.—Though Hampshires may vary in color, they appear to be quite uniform in general type. Possibly, as the breed becomes more numerous and better known, variations in type may become more apparent.

Utility.—It is generally claimed that the Hampshire is a bacon hog, but, in this connection, we must bear in mind that what the American packer calls a bacon hog is very different, as a rule, from the hog which is suitable for making Wiltshire sides for export to Great Britain. Judged from the standpoint of suitability for making export Wiltshire sides, the Hampshire falls far short of requirements, as it is too short in the side, too thick in the shoulder and back, and too heavy in the neck to make a really good Wiltshire side. Inasmuch as the terms "bacon hog" and "bacon type" have been used throughout this treatise to apply only to hogs suitable for supplying export Wiltshire sides, we prefer not to class the Hampshire as a hog of bacon type, though it is well suited for supplying bacon for home consumption.

In quality of flesh, the Hampshire has a high reputation. It has made a good record in the dressed carcass competitions at the International Livestock Exposition at Chicago, and the packers appear to hold it in high esteem. Its flesh carries a high per cent. of lean, and is generally fine-grained.

In early maturity and feeding qualities, the Hampshire seems to be giving good satisfaction to those who are handling it, and it is highly esteemed as a grazer. It is an active, hardy breed, and there is no apparent reason why it should not give as good an account of the food it consumes as any other breed.

The Hampshire ranks high in point of fecundity, and is one of the most prolific of American breeds. Its value for cross-breeding is not well known, but it seems reasonable to suppose that it should cross well with the fat types of hogs.

LARGE YORKSHIRE (OR LARGE WHITE).

Description.—The Large Yorkshire is one of the largest of the breeds of swine. The face is slightly dished, and the snout should be of medium length and practically straight. "Turned-up" snouts, which were common at one time, are not popular with Large Yorkshire breeders at present. The jowl should be of good width and muscular, but not flabby nor heavily loaded with fat. The ears are large, and sometimes incline forward, especially in old animals, but an erect ear, firmly attached to the head, is preferred. The ear should not be coarse, and should be fringed with fine hair. The shoulder and back are of only medium width, the side is long, and the ham carries very little surface fat, making it lighter than the ham of the fat or lard hog. The ham generally has a tapering appearance toward the

hock, and should be well fleshed on the inside of the thigh, but there should be no wrinkles or flabbiness. The bone is fairly heavy, but should be clean-cut in appearance, and the leg is longer than the leg of a fat hog. The color is white. Black hairs should disqualify, but black or blue spots on the skin do not disqualify. The aim of the breeders is to reduce these skin spots to a minimum, and they object seriously to an animal which shows considerable patches of dark colored skin.

Origin and History.—The Large Yorkshire is of English origin, and is descended from a race of large, coarse-boned, leggy, white hogs which were common in Yorkshire and adjacent counties for a great

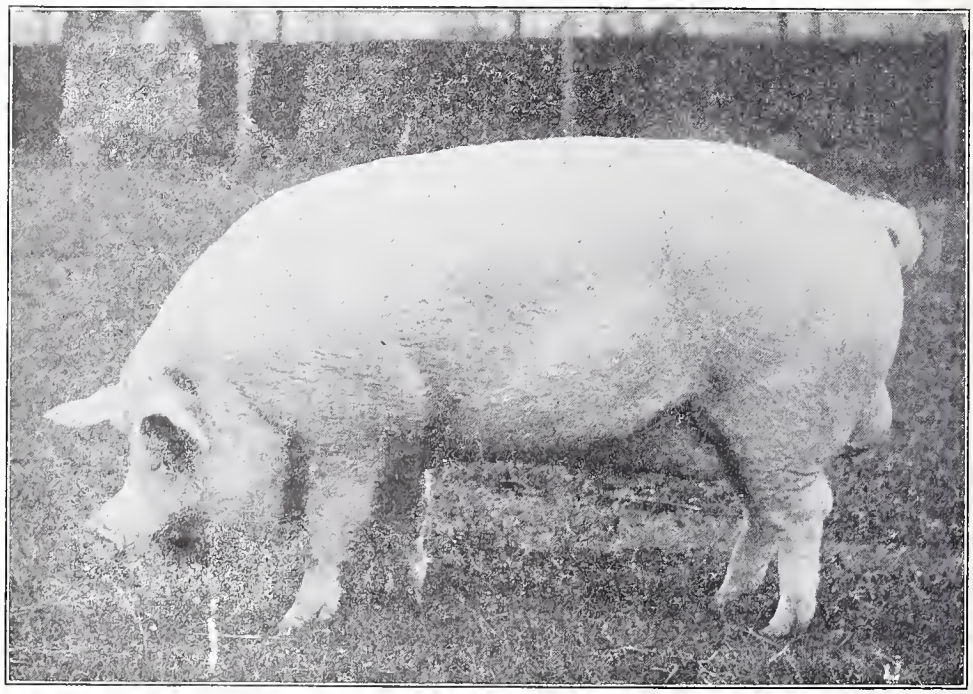


PLATE 14.

Large White (Large Yorkshire) boar, winner of first prize at the English Royal Show, 1905. Bred by the Earl of Ellesmere. Note the length, the smoothness, and the strong top line of this boar; also his excellent quality of bone, which is strong and clean cut in appearance. (Courtesy Wm. Cooper & Nephews, Berkhamsted, England.)

many years, but whose origin seems to be unknown. Owing to the great size of the original type, it was possible to cross them with finer breeds, and still retain plenty of size in the improved animal. The main improvement in the breed has taken place within the past sixty or seventy years, and it is said that the first important step was the crossing of the Yorkshire with the White Leicester, which was a large breed, but finer in the bone, and more easily fattened than the old Yorkshire. It is also said that the White Leicester resulted from crossing a white Chinese breed with the original Yorkshire. Further improvement was effected by crossing with the Small White breed of England, at least, such is the claim made by some authorities, though we have no very definite information regarding the various steps

taken in improving the breed. Careful selection in the hands of skilful breeders has done much to improve the breed within recent years.

Though Large White hogs have been brought into the United States at various times during the past century, the first importation of the improved type of Large Yorkshire was made in 1892. The headquarters for the breed is Minnesota, though representatives are to be found in nearly all the states of the Union. Outside of Minnesota, the states of North Dakota, South Dakota, Iowa, New York, Ohio, Michigan, Wisconsin, Virginia and Massachusetts are probably the most important centres for the breed.

In Canada, the breed has made greater progress than in the United States, and is largely represented in every province, especially in On-

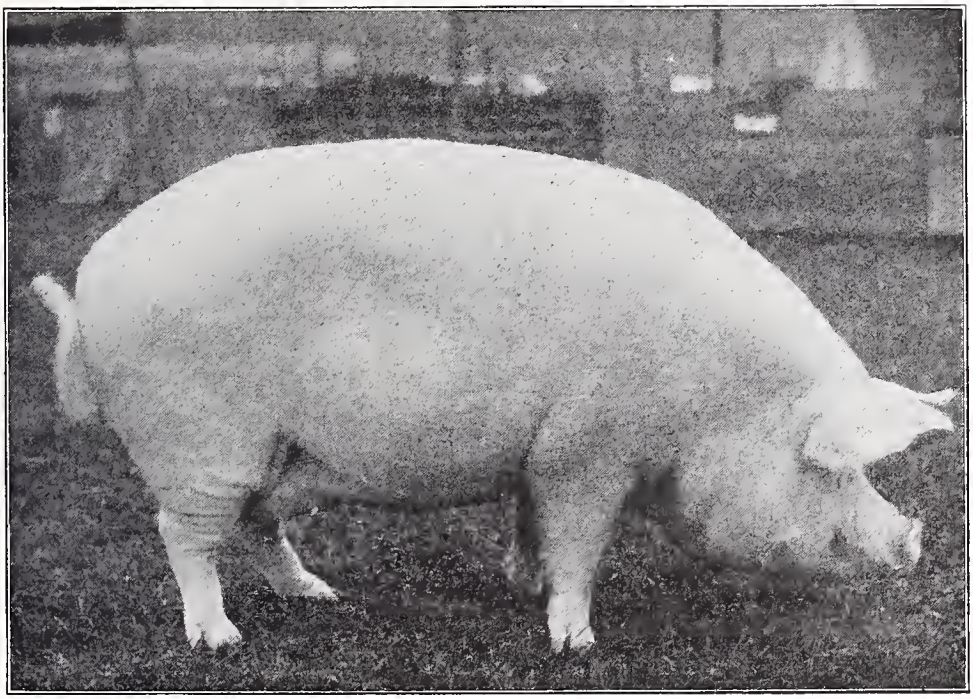


PLATE 15.

Large White (Large Yorkshire) sow, winner of first prize and championship at the English Royal Show, 1905. Bred by the Earl of Ellesmere. This sow is not standing well. The picture shows her a little weak in her hind pasterns, and not quite so clean in the bone as the boar represented above. (Courtesy Wm. Cooper & Nephews, Berkhamsted, England.)

tario. The fact that Canada has been making a specialty of export bacon is responsible, in a large measure, for the prominence which the breed has attained.

Large Yorkshires also occupy a very important place in Denmark, and there are comparatively few counties of any importance from a livestock standpoint where the breed is not represented.

Types.—Large Yorkshires are inclined to vary more or less in type, and it requires skill in selection to keep them true to the best type. It used to be quite common to find short, turned-up snouts among

representatives of the breed, but since this style of snout is commonly associated with a heavy jowl, neck, and shoulder, the best breeders are striving to eliminate it. Another type sometimes met with has a long, scrawny neck, narrow chest, and long, coarse-boned legs. This type generally has plenty of length and a smooth shoulder, but it is apt to be a slow feeder, and possesses too much bone and too thick a skin, together with a lack in quantity and quality of flesh. The best type of Large Yorkshire has sufficient length to make a good Wiltshire side, and has constitution and quality to such a marked degree that it is unexcelled from a feeder's standpoint. Generally speaking, American breeders incline towards a rather shorter and thicker type than is popular with Canadian breeders.

Utility.—The Large Yorkshire is highly valued for bacon production, where a long side abounding in lean meat, and a light shoulder and neck are especially desirable. For quality of bacon, it is rivalled only by the Tamworth. The large proportion of lean to fat, the thick, fleshy belly, and great length of side, render the breed peculiarly desirable from the bacon curer's and the consumer's standpoint. At the Ontario Provincial Winter Fair, held annually at Guelph, Canada, Large Yorkshires and their grades always take a prominent place in the bacon carcass competition, and carry off a large share of the prizes.

The Large Yorkshire is spoken of quite commonly as being slower in maturing than the fat types of hogs, but this is not a fair way of stating the case. From a bacon curer's standpoint, Large Yorkshires will reach desirable market weight and condition at as early an age as any existing breed, and there are few breeds which equal them in this respect. Therefore, so far as the farmer who is feeding hogs for the export bacon trade, is concerned, no breed excels the Large Yorkshire in point of early maturity. For the production of a very fat carcass at an early age, the Large Yorkshire is not so well adapted as the fat or lard types. It is a special purpose breed, and for that special purpose will mature just as early, or earlier, than almost any other breed.

From the fact that it grows rapidly and develops bone and muscle more rapidly than it forms fat, feeders are inclined to regard the Large Yorkshire as an expensive hog to feed, but experiments go to show that such is not the case, and that, under most circumstances, it is capable of giving as large gains for food consumed as any other breed. Probably it is not so well adapted to grazing as some other breeds, and a hot sun is apt to blister its skin. It is possible, too, that it would not thrive so well as some other breeds upon an exclusive corn ration. Where a mixed ration is used, and especially where pen feeding is practiced, it gives a good account of the food it consumes.

The large size and the strong bone of the Large Yorkshire, make it valuable for crossing upon breeds that have become unduly fine in the bone and that lack size. It crosses well with almost any of the fat breeds, increasing the size and the proportion of lean without injuring the feeding qualities. Large Yorkshire sows are prolific, and are good nurses, and the boars are exceptionally prepotent, stamping their character and color upon their progeny to a remarkable degree, no matter what they are crossed with.

TAMWORTH.

Description.—The Tamworth ranks with the Large Yorkshire in size. It has a rather long, straight snout, and usually has little or no dish to the face. The ear is large, firmly attached, generally inclined slightly forward, and fringed with fine hair. The ear should be quite thin, and it is rather more pointed than that of the Large Yorkshire. The Tamworth has a very light jowl, and a light neck and shoulder. The back and loin are of medium width, and the side of good length, but only of moderate depth as compared with a fat hog. Quite commonly, the ham is deficient, and breeders are making an effort to strengthen this point. The bone is fairly heavy, and the leg looks long compared with that of a fat hog. According to the standard of the National Pig Breeders' Association of Great Britain, the Tamworth should have "golden red hair on a flesh colored skin, free from black," but the shade of red varies considerably in individuals, and a chestnut shade is quite common. The color generally grows darker with age, and the color of some aged animals is such a dark shade of chestnut that the casual observer might easily mistake it for a dull black.

Origin and History.—The Tamworth is of English origin, and takes its name from Tamworth in Staffordshire. The breed is of ancient and uncertain origin, no well authenticated account of where it came from being available. Originally, it was an extremely leggy, narrow type of hog, and it is not clear whether improvement was affected entirely by selection, or whether cross-breeding was resorted to. The Tamworth is one of the oldest of English breeds, but it was not given a separate class at the Royal Show until 1885.

Tamworths were brought to the United States nearly thirty years ago, but they have not made rapid progress. Possibly the long snout tends to prejudice the farmer against them, but the fact that the production of bacon hogs receives scant encouragement in the United States is an important factor in deterring the progress of the breed. Representatives of the breed are to be found in a number of states, notably in Illinois, Kentucky, Iowa, Kansas, Texas, Wisconsin and Ohio.

Tamworths have made much more progress in Canada than in the United States, though they are not so numerous as the Large Yorkshire. They are to be found in practically every province of Canada, but Ontario is the principal centre for the breed. England and Canada take the lead in the production of Tamworths.

Utility.—The Tamworth is especially adapted to the production of export bacon, or a class of bacon which carries a large proportion of lean to fat. In early maturing qualities, it is similar to the Large Yorkshire, producing a bacon carcass fit for export at as early an age as any other breed, but for producing a fat carcass at an early

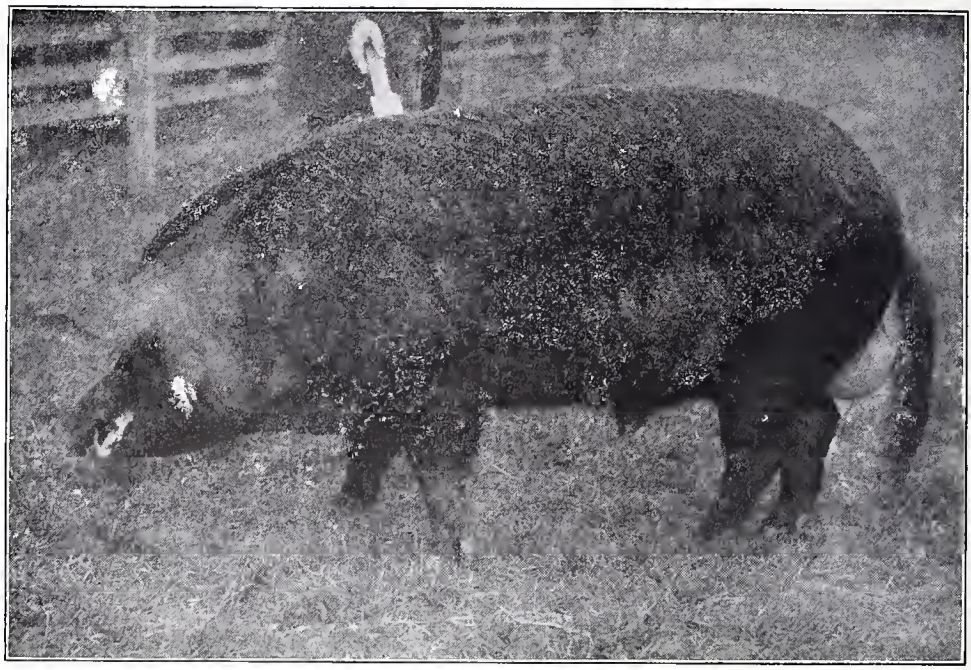


PLATE 16.

Tamworth boar, winner of first prize at the English Royal Show, 1904. Exhibited by Robert Ibbotson. (Courtesy Wm. Cooper & Nephews, Berkhamsted, England.)

age, the Tamworth is not so well suited as some other breeds. For bacon production, therefore, the Tamworth matures early, and it is from the bacon standpoint that this breed must always be judged.

There is a popular belief that the Tamworth does not make economical use of food, but experimental work shows that this belief is not well founded, and that the Tamworth compares very favorably with other breeds as an economical producer of meat. Like the Large Yorkshire, it is probably rather better adapted to pen feeding than to pasturing, but its ability to stand heavy corn feeding is practically unknown.

It is claimed by its admirers that the Tamworth produces higher class bacon than any other breed, but where it has come into competition with Large Yorkshire in dressed carcass competitions, the Large Yorkshire has carried off the larger share of the prize money.

There is no question, however, that the Tamworth produces bacon of exceptionally fine quality, well mixed with lean, and fine in the grain. The Large Yorkshire and the Tamworth are the only strictly bacon breeds with which we are familiar in America.

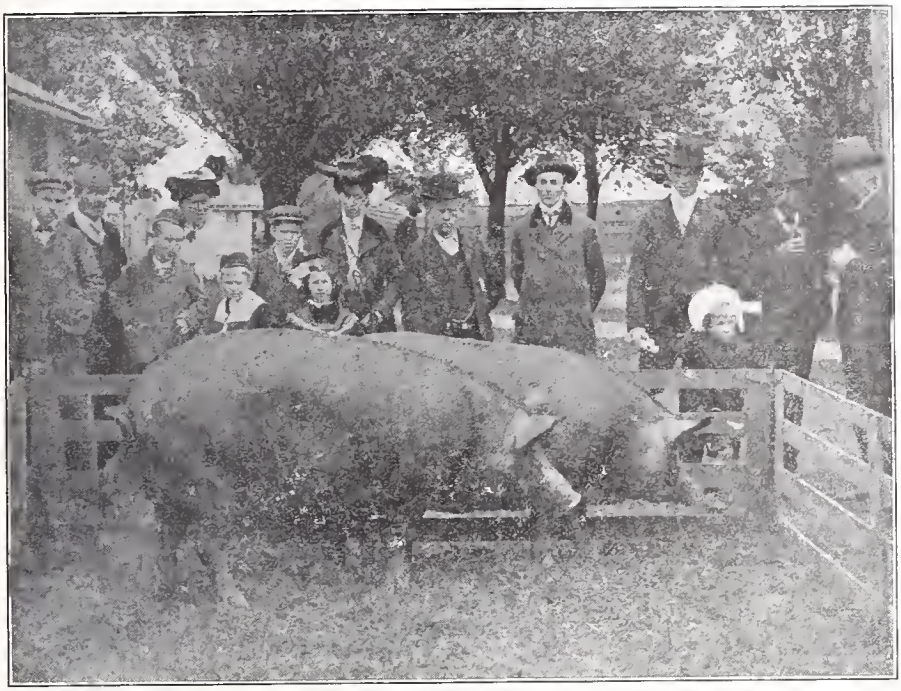


PLATE 17.

Pair of Tamworth sows, Toronto prize winner. Exhibited by Colwill Bros., Newcastle, Ont.

Being a large breed with strong bone, the Tamworth is suitable for crossing upon finer and fatter breeds, and is very popular for this purpose where it is best known. The boars are prepotent to quite a marked degree, and the sows are good mothers, being prolific and good nurses.

VICTORIA.

Description.—The Victoria is a medium sized breed, being similar in size to the Berkshire. It has a rather short snout, dished face, and a medium-sized, erect ear which is firmly attached to the head. The jowl is full, the neck short, the shoulder wide, the body broad and deep, and the ham well developed. The legs are short, and the bone rather fine and of good quality. The color is white, with occasional dark spots on the skin.

Origin and History.—At one time there were two breeds of Victoria swine, but only one breed is now recognized. The breed which is now known originated in the hands of George F. Davis, Dyer, Indiana, and was formed by combining the blood of the Poland China, Berkshire, Chester White and Suffolk, and by careful selection of resulting types which were deemed satisfactory. The breed had its origin about 1870.

About 1850, a breed known as the Victoria was originated by Colonel F. D. Curtis of New York State. It is said to have resulted from a combination of Irish Grazier, Byfield, Yorkshire and Suffolk blood. This breed is not now generally recognized as a distinct breed.

According to Professor Plumb, the Victoria is found mainly in Indiana, Ohio and Illinois, with odd herds in a few other states. For some reason, the breed does not seem to make much progress, and is not at all widely known.

Utility.—The Victoria belongs to the fat class of hogs. There seems to be a dearth of experimental data bearing upon the early maturity and feeding qualities of the Victoria, but the fact that it has not gained more rapidly in popularity would indicate that farmers do not think that it possesses any advantages over other breeds. The quality of the meat is said to be good, and the breed also bears a good reputation for being prolific. The value of the breed for crossing purposes is not well known.

CHESHIRE.

Description.—The Cheshire is about medium size, but some specimens attain heavy weights. It is claimed that the Cheshire weighs well for its appearance, and that it is a heavier breed than is generally supposed. The face is slightly dished, and the ear rather small and erect. The bone is fine and of fair quality. The body is not noted for depth, but usually has good length, and the shoulder and hams are generally well developed. The color is white. Black spots on the skin are objectionable, but do not disqualify.

Origin and History.—The Cheshire originated in Jefferson county, New York, and dates from about 1855. In a letter to Mr. F. D. Coburn, Mr. J. H. Sanders, of Chicago, who bred Cheshires for some years, expresses the belief that the Cheshire is simply a derivative of the Yorkshire. Yorkshires were brought into Jefferson county and crossed with the white pigs of the district, and it is also believed that Suffolk blood entered into the combination which eventually resulted in the breed known as the Cheshire.

The Cheshire is found mainly in New York State, with a few herds scattered here and there in other states. It has made very slow progress, and is practically unknown outside of the United States.

Types.—In his letter to Mr. Coburn, previously referred to, Mr. Sanders states that in his herd he has produced "all the different types of Yorkshire, from the Large Yorkshire down to the Lancashire Short-face." As bred at present, the type probably does not vary in Cheshire any more than in other breeds.

Utility.—The Cheshire, as generally seen, belongs more to the fat than to the bacon class, though it should not be difficult to develop it into a fairly good bacon breed. It appears to be a good feeder, and its

meat is admitted to be of excellent quality. The sows are fairly prolific, and the boars appear to be prepotent, but very little is known regarding their value for crossing.

ESSEX.

Description.—The Essex belongs to the small breeds, being decidedly smaller than such breeds as the Berkshire or Poland China. The snout is short, the face slightly dished, the forehead broad, and the ears small, fine and erect, but inclined to droop slightly with age. The jowl is heavy, the neck very short, and the bone fine, and the pig as a whole is compact, smooth, short, thick and chunky. The color is all black, no white being admissable.

Origin and History.—The Essex is an English breed and takes its name from the county of Essex, where it was first known. The original Essex pig was a coarse, long-legged, hard-feeding animal, generally black and white in color. In 1830, Lord Western imported black Neapolitan pigs from Italy and crossed them with the Essex, effecting a very marked improvement. It is claimed that in the course of time Lord Western's pigs became somewhat weak in constitution and lacking in fecundity.

Soon after Lord Western commenced improving the Essex pigs, one of his tenants, named Fisher Hobbes, commenced breeding the Essex-Neapolitan, and evolved a strain superior to the pigs bred by Lord Western. The strain bred by Hobbes gained the name of Improved Essex, and acquired great popularity. The Improved Essex was imported into the United States in large numbers at one time, but the importations have practically ceased. It is not largely represented in the United States, but it is to be found scattered here and there in quite a number of states. A few herds exist in Canada, and the breed is to be found in Australia, in several European countries, and, of course, in England.

Types.—To meet the modern demand, many breeders of Essex swine are striving to develop a type with more size, heavier bone and greater length. Judging by some of the exhibits at fairs during recent years, this effort is meeting with some success and Essex pigs are to be seen which give more promise of present day utility than the older type.

Utility.—The Essex belongs to the quick maturing kind, and is easily kept fat. Its lack of size prevents it from becoming popular with the general farmer, and it is perhaps better suited to the requirements of the cottager, who wishes to keep a pig with a minimum outlay for feed. He does not have so many pounds of pork, but he has a fat hog with a small outlay. It has never been demonstrated that

the Essex requires less food for a pound of gain than other breeds, but there is no doubt that it is an economical producer of meat. The meat is fine grained, but excessively fat.

The Essex is suitable for crossing upon extremely coarse breeds, and in the past it played an important part in the improvement of other breeds. At present, there is less need for this sort of work, and the field of usefulness for the Essex has been greatly restricted. It is being used, however, for improving the Razorback of the South.

The Essex is not regarded as prolific, but a great deal depends upon how the sows are managed.

SUFFOLK.

Description.—The Suffolk is a small breed. The face is dished, the snout small and very short, the ears short, small, thin, upright, soft and silky, the neck very short, and the body thick, short and smooth, set upon very short, fine-boned legs. The hair should be fine and silky, and of a pale, yellowish white color. The skin is of a pinkish shade, and should be entirely clear of dark spots.

Origin and History.—The Suffolk is of the same origin as the Small Yorkshire, being an offshoot of the Small White English breed. There is no such breed as a White Suffolk recognized in England, but the name Suffolk is sometimes applied locally to the Small Black breed, of which the Essex is a representative. The Suffolk was brought to the United States many years ago, but it has not made much progress. It is found mainly in the Mississippi Valley, but herds are not numerous. In Canada the breed has nearly disappeared.

Utility.—What has been said regarding Small Yorkshires under this heading, applies to the Suffolk as well, since the breeds are very similar.

SMALL YORKSHIRE.

Description.—The Small Yorkshire may be termed the smallest breed in the United States. It has a very short, turned-up snout; wide face, small, erect ears, heavy jowl and a very short neck. The body is short, thick, deep and smooth and the legs are very short and very fine in the bone. The color is white, and the hair is abundant but fine.

Origin and History.—The Small Yorkshire comes from England, where it goes by the name of "Small White," the name "Small Yorkshire" being of American origin. The breed is believed to be of Chinese origin, but modified by the methods of English breeders. Various types and strains of Small Whites have been bred in England, but at present they are all classed as one breed.

The Small Yorkshire was brought to the United States about 1860, but its progress has been slow. Small herds are to be found, mainly in the East, but the breed does not attract much attention.

Utility.—There does not seem to be any very important place for the Small Yorkshire to fill in America. The breed matures early and fattens easily, but produces excessively fat meat. Like the Essex, it is probably most suitable for the cottager who wants a pig that can be matured with a small amount of feed. There is no American breed that requires crossing with a breed like the Small Yorkshire, unless it is the "Razorback," and the Essex seems rather adapted to this purpose, as its skin will stand the hot sun of the South better than that of a white breed. The Small Yorkshire is not noted for fecundity, and unless some unforseen conditions arise, the breed seems destined to gradually disappear.

MULE-FOOT HOG.

Description.—A marked peculiarity of the Mule-Foot Hog is its solid hoof, and from this peculiar feature the breed takes its name. In general conformation, it is claimed that the Mule-Foot Hog is between the fat type and the bacon type, but it is not noted for great length of side. The color is black, but white points are admissable. More white than black is a disqualification, and any considerable amount of white is regarded as objectionable.

Origin and History.—The National Mule-Foot Hog Record Association, which has its office in Indianapolis, has issued the following statement:

"Up to the present date, the Mule-Foot Hog is a hog without an authentic history. Rumors and reports offer Denmark, Holland, South Africa, Mexico, South America, and the Sandwich Islands as the country of his birth. * * * Reports are so contradictory that this Association cannot, without further research, endorse any of them. Every effort will be made by the Association to discover the origin of the Mule-Foot Hog, and to furnish its friends with a true and complete history."

So far, animals of this breed are not numerous nor widely distributed. Indiana, Missouri, Arkansas, Texas, and Louisiana are probably the principal states for the breed, but the breed is not largely represented in any state as yet.

Utility.—The National Mule-Foot Hog Record Association makes the following claims for the breed:

"As to the special qualifications and fine points of the Mule-Foot Hog, we know it to have greater vitality than any other breed in the United States. We have never known a full blood Mule-Foot Hog to have hog cholera. It is an easy feeder, develops early and rapidly, is in strong demand on the market at a premium. * * The sows are good, gentle mothers and raise large litters of pigs, which, if turned out, will hustle for a living, or they will grow fat and thrive, paying big returns, under good care and attention."

It must be remembered that the claims set forth above are made by admirers of the breed. So far as can be learned, these claims have not been tested by independent investigators.

EXPERIMENTS IN SWINE FEEDING.

It is out of the question to review in detail all the work of experiment stations in swine feeding, but there are certain phases of the work which may be dealt with profitably in a somewhat general way. The problems which face the swine feeder are numerous, and the experiment stations have been working for years to find solutions for some of them. To solve any problem in stock feeding is a tedious matter, because animals differ so much individually in their ability to utilize food, that it requires many repetitions, and the employment of large numbers of animals to answer an apparently simple question. Great care is necessary, therefore, in interpreting the results of livestock experiments, and it will not do to draw general conclusions where only a limited amount of work has been done.

INFLUENCE OF FOOD UPON THE BODY OF THE PIG.

Prof. Henry in his excellent book, "Feeds and Feeding," gives an account of work done along this line by Sanborn at the Missouri Agricultural College, Henry at the Wisconsin Experiment Station, Shelton at Kansas, Duggar at Alabama, and Fortier in France.

Corn, which is the standard hog food of the United States, is a food rich in carbohydrates, or fat-forming constituents, but rather low in protein, or muscle-forming constituents. It is also low in ash, or bone-forming material. The question arose, therefore, whether a food such as corn would not have a tendency to produce more fat in the body of a hog, than would foods which contain a higher percentage of protein and ash. Without going into details, it may be said that corn was fed in opposition to mixtures containing such foods as dried blood, wheat middlings, peas, skim milk, bran, and cow peas, which are foods much richer than corn in protein.

The methods employed in the investigation varied somewhat, but the general results were as follows:

The pigs fed the protein-rich ration generally dressed a somewhat lower percentage of their live weight than those fed the corn ration.

In nearly every case, the pigs fed the protein-rich ration had the largest quantity of blood, and in every case they had heavier livers than the others. Their kidneys were also heavier, as a rule, though there were some exceptions.

In the Wisconsin and Kansas experiments, the tenderloin muscles were removed and weighed, and in both cases, these were heavier in the case of the protein-fed pigs. The tenderloin muscle is an indication of the amount of lean throughout the carcass, and hence it was demonstrated that the carcasses of the protein-fed pigs contained more lean than the others.

As a rule, the corn-fed pigs gave more leaf lard than the others.

At Wisconsin and Kansas, the breaking strength of the thigh bones was tested by a machine designed for such purposes, and in every case the bones from the pigs fed the mixed ration proved stronger than those of the corn-fed pigs, the difference being as high as 32 per cent. in one trial.

Though the experiments described demonstrate very clearly that it is possible to modify the carcass of the pig by a judicious selection of foods, we must not assume that lean meat or fat can be developed to any extent which the feeder may desire. Nature has set a limit in this connection, and what may be accomplished by the feeder in the way of developing lean meat, cannot go beyond a certain point. The theory that any breed of hogs can be fed in such a way as to produce choice bacon for the English market is not borne out by these, or other experiments, nor by the experience of practical breeders who really understand the demands of the market.

A peculiar feature of swine is their tendency to develop fat. If the very best specimens of the bacon type are fed largely upon corn, they quickly assume the fat or lard type, and in one or two generations of such treatment the tendency to become shorter in side and thicker in body become so firmly fixed that it is very difficult to change them back to the bacon type again under any system of breeding and feeding. On the other hand, breeders of bacon hogs know that it requires careful selection and feeding to maintain the type. Even under the most favorable conditions, there is a tendency for the bacon type to change gradually in the direction of the fat type, unless care is exercised in selection. It is safe to say, therefore, that it is easier to increase the proportion of fat in a hog's carcass, than it is to increase the proportion of lean, and that the extent to which the lean may be increased by the character of the food is very limited, and is fixed by the individuality of the animal. Further, any attempt to increase the amount of lean through feeding, must be started when the pig is very young in order to be successful.

POUNDS OF PORK FROM A BUSHEL OF CORN.

As in nearly all livestock investigations, wide variations have occurred in connection with this apparently simple problem. Farmers have been asked to report results through the agricultural papers, and numerous results have been obtained from experiment stations. Prof. Robbins of the Iowa Experiment Station presents a very concise summing up of the question in the columns of "The Breeder's Gazette," where he gives the following table:

	Number of tests.	Number of hogs.	Number of days fed.	Average weight of hogs at start.	Gain per day.	Corn for 100 pounds gain.	Gain per bushel of corn.
				Lbs.	Lbs.	Lbs.	Lbs.
Farmers,	8	322	56	157	1.09	544	10.3
Experiment Stations,	18	144	79	149	1.09	548	10.2
Farmers and Experiment Stations,	26	466	68	153	1.09	546	10.25

The results given in the table are from tests where only whole corn was fed, no supplementary foods or pasture being used. The results from farmers and experiment stations agree very closely, and confirm the general belief that hogs on full feed of whole corn should gain about one pound per day, and make ten pounds of pork from a bushel of corn. This is not a large return from a bushel of corn, but the method of feeding is not the most economical.

WHOLE CORN vs. GROUND CORN.

The Wisconsin Experiment Station has conducted exhaustive experiments with whole corn and ground corn for fattening swine. The experiments extend over a period of ten years. Eighteen separate tests were made, in which a total of 280 pigs were used. Bulletin 145 gives a summary of the results.

The feed required to produce 100 pounds of gain varied from 360 pounds to 820 pounds, the poorest gains being made in the case of young pigs, weighing 84 pounds when the trial began, which were fed upon corn alone, and the best gains for food consumed were made by young pigs which were fed equal parts by weight of corn and middlings with a small allowance of skim milk.

The 140 pigs fed ground corn ate 5,510 pounds more grain and made 2,036 pounds more gain than the 140 pigs fed whole corn.

The pigs fed whole corn consumed an average of 501 pounds of grain for each 100 pounds of gain, and the pigs fed ground corn consumed 471 pounds of grain for each 100 pounds of gain.

Eleven trials out of eighteen showed a saving from grinding, the amount saved varying from 2.5 per cent. to 18.5 per cent. The remaining seven trials showed a loss from grinding, the loss varying from 1.1 per cent. to 11.1 per cent.

The average of the eighteen trials shows a saving of 6 per cent. from grinding corn.

Of the 140 pigs fed whole corn, 45 pigs gained more than the average, and 95 pigs gained less than the average. Of the 140 pigs fed ground corn, 91 pigs gained more than the average, and 49 pigs gained less than the average.

The authors of the bulletin point out that the economy of grinding corn will depend upon the price of corn and the cost of grinding, and the following table is given to assist the farmer in determining when to grind:

SAVING EFFECTED PER BUSHEL BY GRINDING CORN FOR FATTENING PIGS.

	Cents.	Cents.	Cents.	Cents.	Cents.	Cents.	Cents.	Cents.	Cents.	Cents.	Cents.
When corn is worth, ...	25	30	35	40	45	50	55	60	65	70	75
Saved by grinding, ...	1.5	1.8	2.1	2.4	2.7	3.0	3.3	3.6	3.9	4.2	4.5

The authors conclude that where there is plenty of time for maturing pigs, it is doubtful whether it pays to grind the corn. Pigs eat more corn when it is ground, and make somewhat more rapid gains. Ground corn is recommended for finishing hogs that have been fed shelled corn until near the close of the feeding period.

Other experiment stations, including Alabama, Maine, New York, Ohio, West Virginia, Kentucky, and Missouri have conducted tests in connection with this problem. Out of eleven trials at these stations, where the total food consumed is reported, four trials resulted in favor of the whole corn, and seven in favor of ground corn. In one trial where whole corn gave better results, the corn was soaked.

It will be seen, therefore, that the experience of other experiment stations is similar to that of Wisconsin. Results have not been uniform, but the larger number of trials, and the average results are in favor of ground corn, though the difference is not so marked as might be expected.

FEEDING SUPPLEMENTARY FOODS WITH CORN.

It has been already noted that corn is essentially a fat forming food, and that it is not a good bone and muscle former. The evil effects of exclusive corn feeding are most conspicuous in the case of young growing pigs, and numerous experiments have been conducted

in feeding foods with corn which would tend to overcome its objectionable features. The influence of exclusive corn feeding upon the composition of the body has been discussed, but its influence upon the growth and economical gains of the animal has yet to be considered.

Blood Meal and Pea Meal.—In "Feeds and Feeding," Henry of the Wisconsin Experiment Station reports gains and food consumed by three lots of pigs fed as follows:

Lot 1. 1-3 blood meal, 2-3 corn meal.

Lot II. ½ pea meal, ½ corn meal.

Lot III. Corn meal only.

During the trial,

Lot I gained 202 pounds, and required 409 pounds of feed for 100 pounds of gain.

Lot II gained 180 pounds and required 449 pounds of feed for 100 pounds of gain.

Lot III gained 155 pounds and required 481 pounds of feed for 100 pounds of gain.

Blood meal is very rich in protein, and peas are much richer in protein than corn. The effect of using such foods with corn is very noticeable in the larger gains and smaller food requirements for 100 pounds gain.

Bone Meal and Hard-Wood Ashes.—Henry also reports three trials in feeding bone meal with corn, and hard-wood ashes with corn, against corn alone, six pigs from the same litter being used in each trial. Regarding these trials, the author writes:

"As the trials progressed, it became evident that none of the pigs were properly nurtured, though the difference in favor of those getting bone meal or ashes was very marked. The pigs allowed neither ashes nor bone meal were most plainly dwarfed. * * * These dwarfs became so fat that the jowls and bellies of some of them nearly touched the ground."

The following table, taken from "Feeds and Feeding" shows some striking differences:

	When bone meal was fed.	When ashes were fed.	When neither was fed.
Corn meal required to produce 100 pounds of gain (pounds),	487	491	629
Average breaking strength of thigh bones (pounds),	680	581	301
Average ash in thigh bones (grams),	166	150	107

It will be seen from the above table that the appetite of the hog for such substances as ashes is not without significance.

Wheat Middlings and Skim Milk.—J. G. Fuller, of the Wisconsin Experiment Station, reports an experiment with two lots of Berkshire pigs. They were young pigs, weighing about 51 pounds each when the experiment began. One lot was fed corn meal only, and the other was fed a mixture of corn meal, wheat middlings, and skim milk. The following conclusions are drawn from the experiment:

If the pigs were valued at the same price per pound, the mixed ration lot would return a profit practically four times that of the corn lot.

The amount of dry matter required for a pound of gain was twice as great in the corn group as in the mixed ration group.

The mixed ration group made 4 1-5 times as great a gain as the pigs in the corn group.

On an average, the thigh bones of the mixed ration group were 50 per cent. stronger than those from the corn group.

The constitution of the pigs in the corn group was seriously impaired.

Finally, it is highly impracticable to raise growing pigs upon a ration of corn alone.

Soy Bean and Wheat Middlings.—Humphrey and Fuller, of the Wisconsin Experiment Station, report three tests in which soy bean meal was compared with wheat middlings as a supplement to corn. The soy bean is very rich in protein and fat, and the object of the experiments was to compare it with wheat middlings, which are generally recognized as being a good supplement to corn.

Two pounds of corn meal were fed with each pound of soy bean meal or middlings, and skim milk was also fed to both lots. Part of the time the hogs were on pasture, and part of the time in pens. The authors draw the following conclusions:

"Soy bean meal makes an excellent supplement to corn meal for growing and fattening pigs."

"Soy bean meal is from 8 to 10 per cent. more valuable than wheat middlings for economical pork production when the cost of the two feeds is the same."

"For firmness, fine grain, and texture of flesh, and even distribution of fat and lean, the ration of wheat middlings and corn meal is superior to that of soy beans and corn meal."

Looking over these conclusions, we must admit that soy beans have not make a very good showing, because, in most localities, wheat middlings would be very much cheaper. The influence upon the texture and firmness of the meat is also worthy of consideration.

Barley, Shorts, Meat Meal, and Tankage.—The Iowa Experiment Station reports an experiment with forty-eight well grown hogs divided into four lots. The rations of the different lots were as follows:

Lot 1. Corn, two parts; barley, one part; shorts, one part.
Lot 2. Corn.
Lot 3. Corn, nine parts; Armour's meat meal, one part.
Lot 4. Corn, nine parts; Swift's tankage, one part.

Meat meal and tankage are by-products of the packing house, and are both rich in protein. The meat meal used in this experiment contained 66.36 per cent. of protein, and the tankage 53.54 per cent. Such highly concentrated foods must be used in small quantities. The hogs averaged 218 pounds each at the commencement of the trial which lasted thirty-two days.

The average daily gain per hog in each group was as follows: Meat meal, 2.6 lbs.; tankage, 2.3 lbs.; barley and shorts, 2.2 lbs.; corn alone, 1.8 lb.

The food consumed per 100 pounds gain is shown in the following table:

	Corn.	Barley.	Shorts.	Meat meal.	Tankage.	Total.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Lot 1. Corn, barley and shorts,	198.9	99.5	99.5	--------	--------	397.9
Lot 2. Corn alone,	463.5	--------	--------	--------	--------	463.5
Lot 3. Corn and meat meal,	333.3	--------	--------	37.0	--------	370.3
Lot 4. Corn and tankage,	358.8	--------	--------	--------	39.9	397.7

Foods were valued as follows:

Corn, 43c per 56 lbs., or 76.8c per cwt.
Barley, 35c per bushel, or 72.9c per cwt.
Shorts, $18.00 per ton, or 90c per cwt.
Meat meal, $35.00 per ton, or $1.75 per cwt.
Tankage, $33.00 per ton, or $1.65 per cwt.

According to these values, the cost of 100 pounds gain was as follows: Lot 1, $3.15; Lot 2, $3.56; Lot 3, $3.21; Lot 4, $3.41.

It will be noted that the group fed corn alone made the smallest daily gains, and the most expensive gains.

The cheapest gains were made by the lot fed corn, barley, and shorts, though this lot stood third in rate of gain.

The largest gains were made by the meat meal group, but the high price of the meat meal runs up the cost out of proportion to the rate of gain.

In this experiment, meat meal proved superior to tankage as a supplementary food with corn.

Meat Meal.—A second experiment by the Iowa Experiment Station was conducted with different proportions of Armour's meat meal with corn as compared with corn alone. Thirty-six pigs, averaging 137 pounds in weight, were divided into four groups and fed 100 days.

Lot 1. Corn meal 7 parts, meat meal 1 part.
Lot 3. Corn meal 8½ parts, meat meal 1 part.
Lot 4. Corn meal alone.

The average daily gain per pig, and the food consumed per 100 pounds gain, and the cost of 100 pounds gain, were as follows:

	Average daily gain.	Food Per 100 Pounds Gain.			Cost of 100 pounds gain.
		Corn.	Meat meal.	Total.	
	Lbs.	Lbs.	Lbs.	Lbs.	
Lot 1. Corn 7, meat meal 1,	1.74	381.6	54.5	436.1	$3 73
Lot 2. Corn 8½, meat meal 1,	1.78	409.2	47.9	457.1	3 81
Lot 3. Corn 10, meat meal 1,	1.85	409.9	40.9	450.8	3 68
Lot 4. Corn alone,	1.16	556.6	--------	556.6	3 97

In computing the cost, corn meal was valued at 71.4c per cwt., and Armour's meat meal at $37.00 per ton.

It will be noted that the lot receiving 10 parts corn to 1 part meat meal made the most rapid, and the cheapest gains.

As in the first experiment, the hogs fed corn alone made the slowest and most expensive gains.

The report of the experiment states: "The pigs in all lots were uniformly very fat, and the difference in gain between the lots getting meat meal and the one getting corn alone seems to have been mostly in growth, although the meat meal pigs showed smoother, glossier hair."

Meat Meal, Tankage and Shorts.—A third experiment of the Iowa Experiment Station had for its object the comparison of Armour's meat meal and Swift's digester tankage with shorts, as supplements to a corn ration with young growing pigs. As the pigs were young, averaging 60 pounds in weight, it was not thought advisable to feed any of them corn alone in dry lots. The lots that were fed corn as the only concentrate were pastured on timothy or clover pasture. Altogether, 100 pigs were used, and divided into ten groups of ten pigs each.

Tankage and meat meal were fed in the proportion of one part tankage or meat meal to five parts corn meal.

Shorts were fed in two proportions, namely, one of shorts to two of corn meal, and one of shorts to one of corn meal.

The experiment lasted 112 days.

There are many interesting details of this experiment which cannot be given here, and only the leading points will be referred to.

1. Meat meal and tankage proved practically equal as supplements to corn in point of producting gains, as will be seen from the following statement:

Ration.	Gain per hog.
Corn and meat meal on pasture, ...	164.9 lbs.
Corn and tankage on pasture, ...	162.9 lbs.
Corn and meat meal in dry lot, ...	128.8 lbs.
Corn and tankage in dry lot, ...	128.8 lbs.

2. The number of bushels of corn replaced by one ton of supplementary feed was as follows:

Ration.

Corn 2, Shorts 1, one on shorts replaced 46.6 bushels corn.

Corn 1, Shorts 1, one ton shorts replaced 45.3 bushels corn.

Corn 5, Meat meal 1, one ton meat meal replaced 57.9 bushels corn.

Corn 5, Tankage 1, one ton tankage replaced 64.4 bushels corn.

From this standpoint, tankage proved most effective.

3. When the hogs were upon pasture, shorts compared favorably with meat meal. The average total concentrates required for 100 pounds gain in the case of hogs fed corn and shorts on pasture was 403.9 pounds; in the case of the hogs fed meat meal and corn it was 409.6 pounds; for the hogs fed tankage and corn, it was 398.4 pounds.

4. In the dry lots, the highly nitrogenous foods, meat meal and tankage, showed to best advantage as compared with shorts, the average total food requirements for 100 pounds gain being 494.7 pounds for the shorts and corn lots; 409.9 pounds for the meat meal and corn lot; and 460.4 pounds for the tankage and corn lot.

5. Among the conclusions drawn from the experiment, the following statements occur:

"Meat meal and tankage of similar chemical composition are almost equal, pound for pound, as a supplement to a corn ration for growing pigs and fattening hogs."

"Hogs fed on rations composed of corn and meat meal, and corn and tankage, were fully as acceptable to the buyers, both from the standpoint of the quality and condition of the flesh, as those fed on any other rations used."

"Both meat meal and tankage are more valuable adjuncts to the corn ration for dry lot feeding than when pigs or hogs are being developed and fattened on pasture, especially if the pasture be composed of leguminous crops."

"A ration of one-half corn and one-half shorts produced greater gains with less feed per 100 pounds of gain, both on pasture and dry lot feeding, than a ration of two-thirds corn and one-third shorts."

SHORTS, SKIM MILK, TANKAGE, GROUND BONE, ALFALFA PASTURE.

The Nebraska Experiment Station conducted a series of experiments with shorts, skim milk, Swift's digester tankage, and steamed ground bone.

Following are the rations used:

Corn meal alone.

Corn meal 75 per cent., shorts 25 per cent.

Corn meal 25 per cent., skim milk 75 per cent.

Corn meal 90 per cent., tankage 10 per cent.

Corn meal 95 per cent., tankage 5 per cent.

Corn meal 90 per cent., steamed ground bone 10 per cent.

During part of the time, the hogs were on alfalfa pasture, so that it is possible to study the effect of alfalfa with corn. The last experiment brings out the comparison very clearly, as is shown in the following table:

	On Alfalfa Pasture.		In Dry Lot.	
	Food for 100 lbs. gain.	Cost.	Food for 100 lbs. gain.	Cost.
Corn meal alone,	343	$2 38	543	$3 88
Corn 75%, shorts 25%,	336	2 64	533	4 18
Corn 25%, skim milk 75%,	*249 †704	3 19	*385 †1,063	4 87
Corn 90%, tankage 10%,	322	2 72	487	4 10
Corn 90%, ground bone 10%,	336	2 62	533	4 17

*Corn.
†Skim milk.

In computing the cost, corn was valued at 40c per bushel, shorts at $20.00 per ton, skim milk at 20c per hundred pounds, tankage at $40.00 per ton, and ground bone at $30.00 per ton.

It will be noted that while the hogs were upon alfalfa pasture, the amount of corn required for 100 pounds of gain with the lot fed corn meal alone, compares very favorably with the other groups. But

when the hogs were put into dry lots, the food for 100 pounds gain in the corn group is much higher than in the tankage group. The same is true of the corn and shorts group as compared with the corn and tankage group, so that here we find the same result as was found in the Iowa experiments.

If the same values for foods were used in the Nebraska experiments as were used in the Iowa experiments, the supplementary foods would make a better showing.

It must also be remembered that in Nebraska the hogs were kept upon alfalfa pasture until they were well grown, and, in consequence, were in the best possible shape to stand exclusive corn feeding on the dry lots.

Following are some points taken from Prof. Burnett's conclusions in connection with the investigation:

When pigs were in a dry lot, the use of tankage as about 5 per cent. of the ration generally reduced the cost of the pork produced.

All these experiments tend to show the suitability of corn and alfalfa as a ration for hogs.

The lot receiving corn and steamed ground bone show gains at practically the same cost as the lot receiving 5 per cent. tankage. The lot receiving ground bone required more food for 100 pounds gain, but the ground bone cost less per ton.

Skim milk at 20c per 100 pounds proved the most expensive supplementary food used.

Where supplementary foods were used, the hogs generally made more rapid gains and reached heavier weights in a given length of time.

In a test of the breaking strength of the bones of the hogs in the Nebraska experiments, it was found that they stood in the following order in point of strength of bone: Corn and ground bone, corn and tankage, corn and skim milk, corn and shorts, corn alone.

Tankage vs. Linseed Meal.—The Indiana Experiment Station reports four tests in which Swift's digester tankage was fed in comparison with linseed meal as a supplement to corn.

The proportion of tankage to corn meal was 1 to 10 in the first experiment, 1 to 32 in the second, 1 to 20 in the third, and 1 to 15 in the fourth.

In each experiment the proportion of linseed meal to corn meal was twice as great as the proportion of tankage to corn meal, the linseed meal being poorer in protein than the tankage.

Corn was valued at $18.00 per ton, tankage at $40.00 per ton, and old process linseed meal at $30.00 per ton.

In two experiments, linseed meal proved slightly more economical than tankage, and in the other two, tankage had a fairly marked advantage.

The average of the four experiments show the food requirements and cost of 100 pounds of gain to be as follows:

Corn meal and tankage: 370 lbs. corn, 24.5 lbs. tankage, costing $3.82.

Corn meal and linseed meal: 363.6 lbs. corn, 46.2 lbs. linseed meal, costing $3.96.

It is noted in the summary that hogs fed on a ration of corn meal and tankage consume more feed and made more rapid gains than hogs fed a ration of corn meal and linseed meal.

Also, that a ration of corn meal and tankage gives a better finish than one of corn meal and linseed meal.

Soy Bean Meal vs. Linseed Meal.—Indiana also reports two experiments comparing soy bean meal with linseed meal as supplements to corn.

In the first experiment, 5 parts of corn meal were fed with 1 part of linseed meal or soy bean meal. In the second experiment, 8 parts of corn meal were fed with 1 part of linseed meal, and 7 parts of corn meal with 1 part of soy bean meal.

Linseed meal and soy bean meal were both valued at $30.00 per ton, and corn meal at $18.00 per ton.

On an average of the results of the two trials, it required for 100 pounds of gain:

Corn meal and linseed meal, 378 lbs. costing $3.71.

Corn meal and soy bean meal, 360 lbs. costing $3.55.

The percentage of protein in linseed meal and soy bean meal is very similar, and though soy bean meal showed an advantage over linseed in these experiments, the difference is not very marked.

Linseed Meal.—Professor Forbes of the Missouri Experiment Station reports results of an experiment in which 100 pounds of a mixture of 5 parts corn to one part linseed meal, proved equal to nearly 148 pounds of corn alone.

Tankage.—Indiana was the first experiment station to test tankage as a supplement to corn. In this trial, foods were valued as follows: Corn meal, $20.00 per ton; shorts, $16.00 per ton; tankage, $30.00 per ton. This method of valuing foods is very much more in favor of tankage as compared with corn, than the system followed in Nebraska.

The cost of 100 pounds of gain under this valuation of foods was as follows:

Lot I. 10 parts corn meal, 1 part tankage, ...	$3.80
Lot II. 5 parts corn meal, 1 part tankage, ...	4.00
Lot III. Corn meal only, ...	5.20
Lot IV. 10 parts mixture of corn and middlings, 1 part tankage, ...	3.60

There were four pigs in each lot, and lot I gained 4.63 pounds per day, lot II, 4.91 pounds, lot III, 2.68 pounds; and lot IV, 4.55 pounds, a striking illustration of the effect of tankage upon the rate of gain.

Summary.—Many other instances of the effect of supplementary foods with corn might be given if space permitted. Sufficient tests have been quoted to establish a few important points which may be enumerated as follows:

1. Corn alone falls far short of being an ideal ration for hogs. It is especially injurious to young pigs, resulting in lack of growth, weakness of bone, and expensive gains.

2. When wisely combined with a supplementary food relatively rich in protein, corn makes one of the best hog foods obtainable.

3. Pasture, either grass or clover, makes a good supplement to corn, clover and alfalfa being especially desirable.

4. Very high-priced protein foods, such as tankage and meat meal, must be used in small proportions, and give best relative returns when used in dry lot feeding.

5. When hogs are on pasture, a comparatively cheap food, such as wheat middlings, will supplement corn to better advantage than expensive foods like tankage and meat meal.

6. Where soy beans can be grown to advantage, they constitute a valuable food to use as a supplement to corn.

HOGGING OFF CORN.

The Minnesota Experiment Station has issued a most interesting bulletin on this subject. Hogging off corn means, turning the hogs into a field of standing corn, and allowing them to pull down the stalks and consume the corn at will.

Two experiments were conducted in which hogs allowed the run of a corn field were compared with hogs fed in a dry lot on ear corn. In the first experiment no shelter was provided for either lot, but they were given straw for bedding. In the second experiment, the yard hogs were given shelter, but the field hogs were treated as before.

Shorts were fed to each lot as a supplement to the corn, at the rate of one pound of shorts per day per hundred pounds weight of the pigs.

In the first trial there were 26 field hogs and 13 yard hogs; and in the second trial, 32 field hogs and 8 yard hogs.

The first trial commenced October 11th and ended November 29th. The second trial commenced September 19th, and ended November 9th.

In each trial, the field hogs were given an acre of corn at a time, instead of being allowed the run of the whole field.

The ear corn consumed by the field hogs had to be estimated by taking samples.

The average daily gain per hog in the two trials was as follows:

1st trial: Field lot, 1.3 lb. Ear corn lot, .98 lb.

2nd trial: Field lot, 1.44 lb. Ear corn lot, 1.09 lb.

The amount of feed consumed per 100 pounds of gain was as follows:

		Food Consumed per 100 Pounds Gain.		
		Shorts.	Ear corn.	Total.
		Lbs.	Lbs.	Lbs.
First trial,	Field lot,	139	696	835
	Yard lot,	169	831	1,000
Second trial,	Field lot,	103	532	635
	Yard lot,	146	573	719
Average of two trials,	Field lot,	121	614	735
	Yard lot,	157	702	859

The larger amount of feed for 100 pounds gain in the first trial as compared with the second trial, is due to the fact that the weight of the ear corn when first husked was used in the first year's calculations, whereas the second trial is calculated upon a shrunk corn basis, that is, corn dry enough for market.

It will be seen that the field hogs made larger and more economical gains than the yard hogs in each experiment.

In the second experiment, a third group of hogs was used. These hogs were fed in a dry lot upon snapped corn, that is, the ears of corn without the husks removed. This lot occupied an intermediate position, both in rate and economy of gain, the snapped corn giving better results than the ear corn.

The following notes are taken from a summary appearing in Bulletin 104:

"The cost of fencing corn fields may be from $1.00 to $2.50 less per acre than the husking."

"It requires no more labor to prepare for subsequent crops, fields that have been hogged off than those that have been treated by the ordinary methods of harvesting."

"Hogs waste no more corn in field than when fed in yard. They pick the corn as clean as most men do in husking."

"Three pounds of rape seed (per acre) sown in corn at last cultivation, furnishes considerable succulent feed, which may take the place of high priced shorts."

"It is not expected that all corn raised be fed off with hogs, but the amount they can clean up from the time it is nicely glazed until the weather becomes unfavorable, may be economically fed in this way."

"Hogs should not, as a rule, be turned into more corn at one time than they can eat up clean in two or three weeks. The shorter period is preferable."

It is recommended that varieties of corn be grown that will mature sufficiently by the first of September, so as to prolong the feeding period.

Pigs weighing from 100 to 140 pounds are best for the purpose. Small pigs are not suitable.

The table which follows is designed to show, approximately, the number of days required to hog off an acre of corn by a given number of pigs weighing 125 pounds.

	With Corn Shrunk to January 1, and Yielding.								
	30 bu. per acre.	35 bu. per acre.	40 bu. per acre.	45 bu. per acre.	50 bu. per acre.	55 bu. per acre.	60 bu. per acre.	65 bu. per acre.	70 bu. per acre.
	Days.	Days.	Day	Day	Days.	Days.	ays.	Days.	Days.
Will keep 10 hogs,	22.5	26.2	30	33	37.5	41.2	45.0	48.0	52.5
Will keep 20 hogs,	11.2	13.1	15	16	18.7	20.6	22.5	24.3	26.2

From this table a farmer can readily reckon about how long a given field of corn will last any number of hogs.

The system calls for the use of portable fences.

The bulletin contains favorable reports from a number of farmers in different states who practice hogging off corn.

HOGS FOLLOWING STEERS.

Many farmers who fatten steers regard the hog as a necesasry adjunct to the business if a profit is to be obtained. The hogs work over the droppings of the steers and fatten upon the undigested grain voided by the cattle.

The number of hogs per steer, which can be used to advantage, will vary with the character of the ration fed the steers. H. W. Mum-

ford, in Bulletin 103 of the Illinois Experiment Station, states: "Where enough pigs are provided to consume undigested feed in the droppings of steers, it requires fully twice as many where corn is fed whole as it does where meal is fed to the steers." The same writer secured gains on hogs following steers ranging from 111.5 pounds of pork to 6.3 pounds of pork per steer, in a feeding period of six months. The largest gain was made by hogs following steers fed shelled corn, and the smallest by hogs following steers fed corn meal and silage.

Circular No. 12 of the Indiana Experiment Station gives a summary of nine hundred and twenty-nine replies to questions bearing upon beef production sent out by the Experiment Station. Eighty-eight per cent. of those sending replies reported that it was not profitable to feed cattle unless hogs follow. The average number of hogs per steer was 1.5, which is regarded as high by the authors of the Circular, unless additional feed is supplied the hogs. Indiana experiments indicate that the waste will not support more than one hog to a steer. The average age of hogs preferred by cattle feeders for following steers was about 5 months, and the average weight 92 pounds, denoting that comparatively thin, active hogs following cattle was reported as 1.4 pounds per hog per day.

Bulletin No. 76 of the Missouri Experiment Station is similar to the Indiana Circular, and embraces the experience of nearly a thousand cattle feeders in Missouri, Iowa, and Illinois. Director Waters summarizes the replies to the questions of the number of hogs per steer, as follows: "An approximate average number of hogs per steer would be like the following, on the basis of two-year-old cattle and 100 or 150-pound hogs: Snapped ear corn, 2 to 3 hogs per steer; ear corn, 1½ hogs per steer; shelled corn, 1 to 1½ hogs per steer; crushed or ground corn, 1-3 to ½ hog per steer."

The more liberally the cattle are fed, the more hogs can be maintained upon their droppings, and it is quite likely that the greater care exercised by experiment stations in feeding steers to prevent waste, accounts for the greater number of hogs maintained per steer in ordinary feed lots, than in the feed lots of experiment stations.

When hogs are following corn-fed steers, supplementary foods rich in protein are found beneficial, just as they are beneficial when corn is fed directly to the hog. Waters points out that: "Hogs make better gains when following cattle fed corn and clover, or cowpea, or alfalfa hay, than when following cattle fed corn and timothy, millet, sorghum, or straw for roughness." He also states that hogs following cattle fed linseed-meal or cottonseed-meal along with their corn ration, make better gains than those following cattle fed corn alone, the linseed-meal proving especial beneficial. In twelve years' experience, he has found no evil effects upon hogs following cattle

whose meal ration contained one-sixth to one-quarter cottonseed-meal.

In summer feeding, access to a pasture will take the place of other supplemental foods, clover and alfalfa being especially effective.

VARIOUS GRAINS, MEALS, AND BY-PRODUCTS.

Peas or Canada Field Peas.—This grain is comparatively little known in the United States, and is used to a smaller extent for pig feeding in Canada than it was some years ago, mainly owing to the high price it commands for other purposes.

At the Utah Experiment Station, hogs fed ground peas and bran, equal parts, made an average daily gain of 1.09 pound and required 363 pounds of meal for 100 pounds of gain; while hogs fed corn and bran made an average daily gain of .63 pound and required 455 pounds of meal for 100 pounds of gain.

At the South Dakota Station, the daily gain of pigs fed whole soaked peas was 1.21 pound, and for soaked corn meal 1.40 pound, but the grain required for 100 pounds gain was 421 pounds for the pear group and 458 pounds for the corn lot.

The Ontario Agricultural College found that feeding pea meal alone was injurious to pigs, the heavy, close nature of the meal making it indigestible. This peculiarity of pea meal is generally recognized. Pea meal alone was less satisfactory than corn meal alone, but when mixed with one-third of its weight of wheat middlings, it gave much better results than corn meal.

The pea meal is very rich in protein and should make a good supplementary food to corn.

Barley.—Barley is richer in bone and muscle forming constituents than corn, having a higher percentage of ash and protein. In fattening constituents, it is scarcely equal to corn.

The Wisconsin Experiment Station reports two feeding trials with barley and corn. In the first trial, the grains were fed alone, and in the second they were fed with skim milk.

The first of the trials shows that it required 471 pounds of barley to produce 100 pounds of gain, and 435 pounds of corn to produce 100 pounds of gain.

In the second trial it required 330 pounds of barley and 398 pounds of skim milk for 100 pounds gain, and 306 pounds of corn and 371 pounds of milk for 100 pounds gain. In each trial, therefore, it required more barley than corn for 100 pounds gain.

Colorado and Ontario experiments found in favor of barley as compared with corn.

The first Wisconsin trial gave the most marked results in favor of corn, and it is worthy of note that the hogs in this trial averaged over 200 pounds in weight at the commencement of the trial. Where younger hogs were used, barley made a better showing as compared with corn. There is little doubt that, considered as a fat former, corn is superior to barley, and hence well grown pigs would be able to stand exclusive corn feeding much better than younger pigs. The writer's experience would lead him to prefer barley to corn as a meal ration for growing pigs, and this view is borne out by the experiments noted. One disadvantage of barley is the fact that it is not eaten so readily by pigs as one might wish, and should be mixed with some other food to increase its palatability. Barley is well adapted to mixing with corn as a ration for almost any class of pigs. The extensive use made of barley for swine feeding in Canada, Great Britain, Denmark and other countries, is strong evidence of its value.

Wheat.—Wheat has been experimented with, more or less, as a food for swine, and results show that there is comparatively little difference between wheat and corn in feeding value. Wheat contains less fibre than barley, but ground wheat alone can hardly be regarded as a satisfactory ration, owing to the fact that it is likely to cause digestive troubles. It gives much better results when mixed with other meal, and combines well with corn. As a general thing, feeding sound wheat is out of the question, owing to its relatively high price. It is only under exceptional circumstances that it can be counted among foods for swine.

The Wyoming Station secured better gains for food consumed from wheat than from corn in each of two experiments, reported in Bulletin 74.

Frosted Wheat.—In some years, considerable of this product is placed upon the market. Wheat may be sufficiently injured by frost to render it unfit for milling, and yet be practically equal to sound wheat for feeding purposes. Frozen wheat varies much in character, depending upon the degree of maturity reached by the grain before being frozen.

In his evidence before the Committee on Agriculture, J. H. Grisdale. of the Central Experimental Farm, Canada, gives details of swine feeding experiments with frozen wheat, fed alone and in combinations. The following table brings out the principal points:

Character of Ration.	Average weight of pigs at commencement.	Average daily gain.	Pounds meal per 100 pounds gain.
	Lbs.	Lbs.	Lbs.
Lot 1. No. 1 frozen wheat 2 parts, shorts 1 part,	99.1	.76	390
Lot 2. No. 1 frozen wheat 2 parts, corn 1 part,	76.0	.77	370
Lot 3. No. 2 frozen wheat 2 parts, corn 1 part,	118.2	1.03	390
Lot 4. No. 2 frozen wheat only,	140.0	1.23	360
Lot 5. No. 2 frozen wheat only,	85.0	.71	380
Lot 6. No. 2 frozen wheat 2 parts, barley 1 part,	104.1	.81	410
Lot 7. No. 1 frozen wheat 2 parts, oats 1 part,	112.1	1.02	390
Lot 8. No. 1 frozen wheat 2 parts, oats 1 part,	74.2	.66	390
Lot 9. No. 2 frozen wheat with 3 lbs. skim milk daily per pig,	99.0	.88	340
Lot 10. No. 1 frozen wheat only,	150.4	.94	410
Lot 11. No. 1 frozen wheat only,	96.3	.79	390
Lot 12. Equal parts No. 1 frozen wheat, No. 2 frozen wheat and corn,	124.8	.94	470

It is unsafe to make comparisons of the different rations, but the table fails to show any advantage of the No. 1 frozen wheat over the No. 2.

The most remarkable feature of the experiment is the uniformly good results obtained with all the groups, indicating frozen wheat to be a valuable food for swine.

At the Ontario Agricultural College, the writer fed three lots of pigs to compare frozen wheat with barley. The frozen wheat tested only 43½ pounds per bushel.

Lot 1 contained 18 pigs, and was fed ground barley and wheat middlings.

Lot 2 contained 20 pigs, and was fed ground frozen wheat and wheat middlings.

The proportion of middlings varied, being reduced as the experiment progressed, but was the same for all lots.

The pigs in lot 1 averaged 41 pounds in weight at the start, Lot 2, 37.7 pounds, and Lot 3, 54.5 pounds.

Lot 1 made an average daily gain per pig of 1.08 lb., Lot 2, 1.1 lb., and Lot 3, 1.18 lb.

The amount of meal consumed per 100 pounds gain was as follows:

Lot 1, 430.9 lbs.
Lot 2, 431.4 lbs.
Lot 3, 432.9 lbs.

Both in rate of gain and food consumed per 100 pounds gain, the three rations may be said to have given practically the same results. In this experiment, therefore, frozen wheat proved equal to barley when fed with middlings.

Oats.—Owing to their high percentage of fibre, oats do not possess a high value for fattening hogs. When used at all, they should be used as only a comparatively small part of the ration, and they show to best advantage when used to lighten and give more bulk to a heavy, close-textured meal, such as pea meal, or even corn meal. They are especially useful for making up part of the ration for boars or breeding sows, where the aim is to maintain vigor without unduly fattening.

Rye.—Extensive Danish experiments summarized by Prof. Henry in "Feeds and Feeding" indicate that rye and barley are about equal in value for pig feeding. Very little experimental work with the grain of this cereal has been done in America. Rye meal is best fed in combination with other kinds of meal.

Kaffir Corn.—At the Kansas Experiment Station, it was found that corn meal had a feeding value of from 17 to 29 per cent. higher than Kaffir corn meal. The addition of soy bean meal to Kaffir corn to the extent of one-third of the ration materially improved its value, but did not make it equal to a similar mixture of corn meal and soy bean meal.

Buckwheat.—The Central Experimental Farm, Canada, reports two trials in which buckwheat was compared with wheat. In the first trial, ground buckwheat was fed against ground wheat, and in this trial 445 pounds of ground buckwheat were required for 100 pounds gain, and 410 pounds ground wheat for 100 pounds gain.

In the second trial, one lot of pigs was fed a mixture of one-half mixed meal, and the other lot a mixture of one-half ground wheat and one-half mixed meal. In this trial it required 405 pounds of the buckwheat mixture for 100 pounds of gain, and 380 pounds of the wheat mixture for 100 pounds of gain. This is a much better showing for buckwheat than might be expected, since buckwheat has a thick, fibrous hull which the hog cannot digest. Ground wheat showed an advantage of only about $8\frac{1}{2}$ per cent. over ground buckwheat, and the wheat mixture an advantage of $6\frac{1}{2}$ per cent. over the buckwheat mixture.

Emmer.—This grain is commonly known as "spelt" or "speltz." Genuine spelt is a distinct plant, possessing general characters similar to emmer, but is a smaller yielder and possesses about ten per cent. more hull than emmer.

The South Dakota Station reports one experiment with emmer, under the name of "speltz." One lot of hogs was fed whole emmer, one ground emmer, and one emmer and corn. Whole emmer required 771 pounds of feed for 100 pounds of gain; ground emmer 826 pounds, and emmer and corn, 529 pounds. It will be seen that a marked improvement was effected when corn was added to the emmer. Ap-

parently emmer has too much hull or husk (about 21 per cent.) to make a first class hog food. Its rational use would be for mixing with concentrated, heavy meals to give more bulk to the ration.

Millet Seed.—The South Dakota Station (Bulletin 83) reports a comparison of millet seed with barley and wheat. The authors of the bulletin state that millet seed can be grown profitably as a fattening ration for swine, but it does not furnish as good a ration as barley or wheat. It is also stated that it required one-fifth more millet than it did barley meal, and a trifle more barley meal than it did wheat to make a pound of grain, and that a bushel of 56 pounds of millet seed is equal to a bushel of 48 pounds of barley for hog feed. Millet meal produced a softer quality of fat than did either barley or wheat meal.

Beans.—Beans are best thoroughly cooked before they are fed to swine. Bulletin 243 of the Michigan Experiment Station reports results from feeding cull beans to growing pigs and fattening pigs. Without going into details, it may be stated that an exclusive ration of beans is not regarded as satisfactory. For growing pigs, a ration consisting of three parts beans and four parts corn meal did not prove so satisfactory as a mixture of two parts beans, two parts wheat middlings, and three parts corn meal. The last named mixture gave an average daily gain per pig of about one and one-third pounds per day, which is regarded as satisfactory.

Three trials of beans compared with equal parts beans and corn meal were made with fattening hogs. The results of the three trials are briefly summarized in the following table.

	Fed beans alone.	Fed equal parts beans and corn.
	Lbs.	Lbs.
Average live weight of hogs,	163	159
Average daily gain per hog,	1.1	1.52
Average food consumed per 100 lbs. gain,	420.9	406.4

The addition of corn meal increased the efficiency of the ration about 3½ per cent.

The relative cost of the two foods, and the cost of cooking, would have to be considered by the feeder in coming to a decision regarding the economy of the rations.

Wheat Middlings.—Wheat middlings, frequently called "shorts," is one of the very best foods for young pigs. It is rich in bone and muscle-forming constituents, and does not tend to make growing pigs too fat. Its value as a supplement to corn has already been noted, and it combines well with almost any kind of meal. As a single food for fattening, it is not economical, but it is conducive to thrift and growth when used as a part of a meal ration for fattening pigs. The younger the pig, the greater the value derived from feeding middlings.

Wheat Bran.—Bran is too bulky and fibrous to constitute a large part of a pig's ration, unless it is mature animals, such as stock boars and breeding sows, or where it is desired to give bulk to a ration that is considered too heavy in character. As a rule, however, middlings can be used to better advantage than bran for the purposes mentioned.

Flour—Various brands of low-grade flour are occasionally put upon the market. Low grade flour has a higher feeding value than middlings, but is entirely unsuitable for feeding alone, owing to its pasty nature. The writer's experience is that it will cause digestive derangement when fed alone, and must be diluted to a large extent with other foods. Bulletin 167 of the Virginia Experiment Station reports better results from soaking low-grade flour, than from feeding it freshly mixed with water.

Corn and Cob Meal.—Whatever advantage corn and cob meal may have over corn meal for other classes of stock, it can scarcely be commended for hog feeding. It is difficult to grind the cob fine enough to make it acceptable to hogs, and as the cob has practically no nutritive value for hogs, it is difficult to see any good reason for including it in their ration, unless it is to act as a diluent for the corn meal, which is inclined to be close in texture and heavy in character. There are many other substances, however, that will answer this purpose and supply nutriment as well. The Missouri Experiment Station gives a decidedly adverse report upon feeding corn and cob meal to hogs, but Kansas and New Hampshire report in its favor. Experimental evidence regarding the problem is somewhat meagre.

Gluten Meal.—The Central Experimental Farm, Canada, reports unfavorably upon gluten meal as a food for swine. J. H. Grisdale says regarding it: "Gluten has been fed in limited quantities, but has not proven very satisfactory for either bacon production, young pigs, or breeding stock. It seems to be rather unpalatable, and produces soft bacon."

The Cornell Station also gives an unfavorable report of this food as compared with corn when both foods were fed with skim milk.

Linseed Meal (Oil Meal.)—Linseed meal has been already referred to under supplementary foods with corn. It is seldom advisable to feed linseed meal to a greater extent than one-fifth of the total meal ration, and as a rule, half this quantity will be found more economical. It is highly recommended by some as a food for nursing sows, and for young pigs after weaning. The writer has had only fair success in its use as a substitute for skim milk with young pigs.

In experiments with substitutes for skim milk for young pigs, the Central Experimental Farm, Canada, obtained an average daily gain of six-tenths of a pound per pig with a mixture consisting of 4 parts wheat middlings and one part linseed meal. It required 280 pounds of the mixture for 100 pounds of gain, which is a very satisfactory showing. The linseed meal was not so satisfactory as skim milk, but gave better results than other substitutes for skim milk tested at the same time.

Cottonseed Meal.—This very concentrated food possesses some property which renders it fatal to hogs when used in considerable quantities. A small allowance per day may be fed without injurious results, but great care is necessary. The Arkansas and Texas Experiment Stations have probably made the most thorough investigations with cottonseed meal, and their recommendations are worthy of note.

Arkansas Bulletin No. 85 gives the following quantities of cottonseed meal per pig per day as being "well within the danger limit."

Pigs under 50 pounds, one-fourth pound per day.

Pigs from 50 to 75 pounds, one-third pound per day.

Pigs from 75 to 100 pounds, two-fifths pound per day.

Pigs from 100 to 150 pounds, one-half pound per day.

Texas Bulletin No. 78 makes the following recommendations:

"1. For animals on heavy feed, that not more than one-fourth the weight of the grain ration consist of cottonseed meal.

2. That this feeding continue not more than 50 days, or that the proportion of meal be reduced if feeding is to be continued longer.

3. That the meal be mixed with other food and all soured together.

4. That as much green food as possible be supplied to the hogs.

5. That a close watch be kept and the meal taken from any animals not eating or not gaining well.

Feeders who have had experience with the meal will probably be able to exceed these recommendations, which, however, allow the use of enough meal to greatly improve a corn diet. One pound of cottonseed meal to five of corn furnishes the nutrients in the most desirable proportions for fattening, while one to two of corn are more nearly correct for young, growing stock."

Hogs following cattle which are fed a considerable amount of cottonseed meal in their ration do not appear to be injuriously affected, though there seems to be exceptions to this rule. Just how much cottonseed meal can be fed to cattle without injury to the hogs following them, does not appear to be definitely settled. Prof. E. T. Robbins, of the Iowa Experiment Station, writing to the Breeder's Gazette, reviews the experience of cattle feeders in connection with this problem, and states: "Even when fed to steers under the best circumstances it may possibly, in the opinion of some feeders, be associated with an unaccountable mortality among the hogs." In summing up, he says: "The general consensus of opinion is to the effect that if fed in no larger amounts than 2 to 3 pounds daily per steer, with as many hogs as steers in the feed lot, all danger to the hogs is practically eliminated."

Oat Feed.—This by-product of the oat meal sometimes has a considerable feeding value, but, owing to the fact that it often contains a large proportion of oat hulls, it is not a very satisfactory food to buy for swine. Experiments with oat feed are not satisfactory, because the product is anything but constant in composition. The same remarks apply to all by-products of the oat meal mills, whatever name they may be sold under.

Brewers' and Distillers' Grains.—Grisdale, of the Central Experimental Farm, reports economical gains from "spirit grains" when fed in combination with a meal ration. Generally speaking, these products are rather bulky and fibrous for swine, unless used in limited quantity as a supplement to a grain ration, in much the same way as alfalfa hay or roots may be used.

Sugar Beet Pulp.—In the wet state, this product may be regarded as similar in feeding value to roots, and may be employed in exactly the same way. The dried pulp is hardly a satisfactory food for swine.

Beet Sugar Molasses.—Beet molasses is unpalatable and generally unsatifactory for swine. Bulletin 199 of the Cornell Experiment Station reports apparent poisoning of hogs fed beet molasses; and Utah (Bulletin 101) reports scouring, and bad flavored pork.

Cane Molasses.—Cane and sorghum molasses are sweet and palatable. Prof. Henry estimates cane molasses as equal to corn in feeding value. As a rule, these products are rather expensive for ordinary feeding, but they are sometimes used in fitting animals for show, as they are appetizing and tempt the animals to eat.

Rice By-Products.—Rice hulls are very woody, and are of very little use for any animals, but are especially objectionable for swine. Rice bran and rice polish have considerable feeding value, but since any food made up from rice by-products is apt to contain a considerable proportion of hull, feeders are inclined to look upon these

foods with suspicion. The South Carolina Experiment Station compared rice meal and skim milk with corn meal and skim milk for pigs, and obtained results slightly in favor of rice meal. The rice meal is stated to consist largely of rice flour, rice polish, and rice bran. At the Massachusetts Experiment Station, rice meal and milk proved practically equal to corn meal and milk for pigs.

Weed Seeds.—Prof. Henry conducted two trials at the Wisconsin Experiment Station with pigeon grass seed, cooked and uncooked, for swine. The results are reported in "Feeds and Feeding."

Lot 1 was fed two-thirds cooked pigeon-grass meal and one-third corn meal, uncooked.

Lot 2 was fed corn meal only, uncooked.

Lot 3 was fed one-third pigeon-grass meal and two-thirds corn meal, both uncooked.

Lot 1 made the largest gains and required the least food for 100 pounds of gain, and Lot 3 made the smallest gains and required the most food for 100 pounds of gain.

Prof. Henry says: "It is evident that pigeon-grass seed when cooked is a valuable feed for swine. * * * * * * * * * To be satisfactory for pig feeding the seed of this grass should be ground and cooked."

At the large elevators, weed seeds and small wheat accumulate in large quantities, and this product can be used to good advantage in feeding swine when judiciously mixed with other meal.

"Stock Foods."—In Bulletin 151 of the Wisconsin Experiment Station, Prof. F. W. Woll gives a review of the work of experiment stations with so-called "stock foods," or "condimental stock foods." In summing up, Prof. Woll says, in part:

"The feeding experiments include twenty-three different trials, conducted at more than a dozen different experiment stations with 992 animals in all; viz., with 78 steers, 81 dairy cows, 604 sheep, 112 pigs, and 117 hens. * * * In going over the evidence presented we find that only two out of the twenty-three different trials showed the stock food to possess any merit; the conclusions drawn from the results of the twenty-one trials is to the effect that nothing was gained by including these foods in the ration fed; in fact they were shown to be a positive detriment in so far that they rendered the rations more expensive and increased the cost of the product obtained, whether this be gain in live weight, milk, butter fat, wool, or eggs."

Among the conclusions drawn from investigation work with "stock foods" are the following:

"They are of no benefit to healthy animals when fed as directed, either as to increasing the digestibility of the feed eaten or rendering it more effective for the production of meat, milk, wool, etc."

"They are of no benefit as a cure-all for diseases of the various classes of live stock; neither do they possess any particular merit in case of specific diseases, or for animals out of condition, off feed, etc., since only a small proportion of ingredients having medicinal value is found therein, the bulk of the foods consisting of a filler which possesses no medicinal properties whatever."

"Exorbitant prices are charged for these foods."

"By adopting a liberal system of feeding farm animals and furnishing a variety of feeds, good results may be obtained without resorting to stock foods of any kind. If a farmer believes it is necessary to feed stock foods at times, he can purchase the ingredients at a drug store and make his own stock foods at a fraction of the cost charged for them by the manufacturers."

The following formulas for stock foods, suggested by two American experiment stations, are given in the bulletin:

1. Ground gentian, one pound; ground ginger, one-fourth pound; powdered saltpeter, one-fourth pound; powdered iron sulphate, one-fourth pound. Mix, and give one tablespoonful in feed once daily for ten days, omit for three days, and feed as above for ten days more. Estimated cost, 20 cents a pound. Estimated tonic value, about four times that of most condimental foods on the market.

2. Fenugreek, 8 pounds; ginger, 8 pounds; powdered gentian, 8 pounds; powdered sulphur, 8 pounds; potassium nitrate, 8 pounds; resin, 8 pounds; cayenne pepper, 4 pounds; flax-seed meal, 44 pounds; powdered charcoal, 20 pounds; common salt, 20 pounds; wheat bran, 100 pounds.

This mixture is said to be: "So near the average stock food that neither the farmer nor his stock could tell the difference." Estimated cost, less than $4.42 per hundred pounds.

3. Powdered gentian, 1 pound; powdered ginger, 1 pound; fenugreek, 5 pounds; common salt, 10 pounds; bran, 50 pounds; oil meal, 50 pounds. Estimated cost $1.50 per hundred pounds.

PASTURE AND SOILING CROPS.

Alfalfa.—Bulletin 155 of the Kansas Experiment Station gives a summary of results from feeding alfalfa to hogs at that institution. The following is quoted directly from the bulletin:

"At this station some years ago, a gain of 800 pounds of pork was made from a ton of alfalfa hay, and a little less than that amount of gain was made from an acre of alfalfa pasture. In another test here, an acre of alfalfa produced $20.20 worth of pork, while an acre of rape fed to a similar lot of hogs returned $10.05 worth of pork.

"In a later experiment we found that 100 pounds of alfalfa hay saved 96 pounds of corn. Figuring on the basis of 5 pounds of corn producing one pound of pork, the 96 pounds of alfalfa would produce 19 pounds of pork. Estimating the average yield of alfalfa

to be four tons per acre, on this basis it would mean a production of 1,600 pounds of pork per acre, with alfalfa fed in the form of hay in connection with corn. This experiment was conducted during the winter season.

"In an experiment during the summer, we found that 170 pounds of green alfalfa, cut and fed to hogs fresh in a dry yard, was equal to 100 pounds of corn, and in this experiment it took 6 pounds of corn to produce a pound of pork. Therefore, assuming 170 pounds of green alfalfa would produce 16 2-3 pounds of pork, a fraction over 10 pounds of green alfalfa would produce one pound of pork. Estimating that an acre of alfalfa will yield during the season 20,000 pounds of green hay, this experiment would show that such an acre of alfalfa, cut green and fed fresh, would produce something like 2,000 pounds of pork. Of course, this is fed in connection with corn, and a statement that an acre of green alfalfa would produce 2,000 pounds of pork would be very misleading. Figuring on the basis of these two experiments, alfalfa hay, yielding four tons per acre (8,000 pounds) would produce 1,600 pounds of pork, and its value at 4 cents per pound would be something like $64.00 per acre; and green alfalfa producing ten tons per acre (20,000 pounds) would produce 2,000 pounds of pork, which, at 4 cents per pound, would be worth $80.00 per acre."

The Kansas results from feeding alfalfa are about the most favorable of which the writer is aware. Very fair results were obtained at the Wyoming Experiment Station, where alfalfa hay and wheat were fed against wheat alone. In this experiment it required 449 pounds of wheat for 100 pounds of gain where wheat was fed alone; and 319.3 pounds of wheat and 291.3 pounds of alfalfa for 100 pounds of gain where wheat and alfalfa hay were fed. On this basis, a ton of alfalfa hay would give scarcely 200 pounds of pork, which is only one-quarter as much pork as was obtained at Kansas from a ton of alfalfa hay. It is well to remember, however, that alfalfa hay varies very much in quality. Well cured, fine-stemmed, leafy hay would be best for hog feeding, and coarse-stemmed hay that had been damaged more or less by the weather, might have very little value for this purpose. Such a discrepancy as that noted between the Kansas and Wyoming results might easily be accounted for on the basis of different qualities of hay, and in the meantime, we may regard the Kansas results as representing the maximum returns from alfalfa. It is also worthy of note that in one Kansas experiment the amount of pork produced by a ton of alfalfa hay was only 235 pounds, an amount only slightly greater than that obtained at Wyoming, so that it would be safer to regard the 800 pounds of pork from a ton of alfalfa hay as a possibility, rather than as something which can be generally depended upon.

The Wyoming Station also tried feeding young pigs, weighing from 60 to 70 pounds, a ration of one-third corn meal or wheat meal, and two-thirds alfalfa hay, but the pigs lost weight, and one died.

On the other hand, mature sows were successfully maintained on a ration of alfalfa hay and turnips without other food, indicating that alfalfa hay is best suited to pigs that are fairly well grown.

Rape.—Rape is a crop which is highly recommended wherever it can be grown successfully. For hog pasture it is best sown in drills about 28 inches apart at the rate of three pounds of seed per acre. It may also be sown broadcast. In most localities, it is safer not to sow until after the first of June. If there is enough moisture in the soil to germinate the seed, it is generally ready for pasture in about six weeks.

The Kansas Experiment Station compared rape with alfalfa for pigs averaging 52 pounds at the commencement of the experiment. Ten pigs were used in each lot. Following are daily gains per head and pounds of grain consumed per 100 pounds of gain:

	Daily Gain.	Grain Consumed per 100 Pounds Gain.
Lot 1. No pasture, ...	1.04 lbs.	371 lbs.
Lot 2. Rape pasture, ...	1.09 lbs.	301 lbs.
Lot 3. Alfalfa pasture, ...	1.10 lbs.	200 lbs.

An acre of rape was required for ten pigs, but half an acre of alfalfa was sufficient for the same number.

An acre of rape pasture produced 202 pounds of pork, and an acre of alfalfa pasture produced 408 pounds of pork.

"This experiment emphasizes the superior value of alfalfa, and likewise emphasizes the value of Dwarf Essex rape, which can be seeded in the feed-lots that would otherwise go to waste or grow up to weeds, and be made to pay a handsome profit on the investment."

At the Wisconsin Experiment Station, Craig conducted two experiments with hogs on rape. In the first experiment, 10 hogs, about eight months old, were pastured on one-third of an acre of rape for 76 days, and fed corn and shorts in addition.

Another lot was fed in a pen on corn and shorts only. In the second experiment, 19 hogs were pastured seven weeks on six-tenths of an acre of rape, as compared with a similar lot in pens on grain only.

In the first trial one-third of an acre of rape was equivalent to 1062 pounds of grain, and in the second trial, six-tenths of an acre of rape was equivalent to 1330.2 pounds of grain. Therefore, in one case an acre of rape was equivalent to 3186 pounds of grain, and in the other, 2217 pounds of grain.

Later, Carlyle, of the same institution, repeated the work, and states: "With pigs from four to ten months old, representing the various breeds of swine, an acre of rape, when properly grown, has a feeding value when combined with a ration of corn and shorts equivalent to 2346 pounds of a mixture of these grain feeds."

The Central Experimental Farm, Canada, reports feeding six pigs on three-sixteenths of an acre of rape from August 14th until snow covered the ground. It is estimated that the rape saved 156 pounds of meal, or an acre of rape would save 832 pounds of meal. This is far short of the Wisconsin returns, but the pigs were young at the commencement of the trial, and it is the writer's experience that young pigs do not make as good pasture as older ones.

Rape vs. Clover.—The Wisconsin Experiment Station reports two trials with pigs on rape and clover. In the first trial there were twenty pigs in each group, and in the second trial twenty-one in each group. The pigs were five to six months old at the commencement. The following table shows gains and food consumed:

	First Trial.		Second Trial.	
	Rape.	Clover.	Rape.	Clover.
Average daily gain per pig,	Lbs. .87	Lbs. .78	Lbs. 1.27	Lbs. 1.22
Amount of grain for 100 lbs. gain,	391	439	322	340

It will be seen that the rape gave somewhat better gains with a smaller meal requirement per 100 pounds gain than the clover, though the difference was not great in the second trial.

Rape vs. Soy Beans.—The Ontario Agricultural College fed soy beans and rape to pigs in pens, the green fodder being cut and carried to the pigs. The pigs were fed meal and skim milk in addition.

An acre of rape furnished 22 tons of green fodder, and an acre of soy beans 15 tons of green fodder.

Soy beans had a higher feeding value per ton than rape, but when the difference in yield was taken into consideration, the two crops proved about equal in amount of pork produced per acre.

Rape has an advantage over soy beans in that it may be sown on a wider range of dates, and retains its green condition for a longer period.

Rape also makes a better pasture crop than soy beans, as it suffers less from trampling.

Clover and Timothy.—In the experiments at the Iowa Experiment Station with supplementary foods with corn, hogs were pastured upon both clover and timothy. Without going into details, it may be said that the experiments indicate that clover produced pork at the rate of 400 pounds per acre, and timothy at the rate of 278 pounds per acre. This is probably more than can be expected from these crops as a general rule.

Hairy Vetch or Sand Vetch.—This crop is very much relished by hogs, and if sown in the fall gives an early pasture of high nutritive value. It may also be sown in the spring, in which case it is rather late in the season before it is ready for pasture, and it does not give the amount of pasture which is desirable. The liability of the crop to winter-kill in some districts when sown in the fall, and the high price of the seed, prevent the crop from becoming widely popular.

Fall Rye.—Rye does not make so valuable a pasture as many other crops, and its main feature is its early growth. For supplying pasture very early in the spring a small plot of rye can often be used to good advantage.

Cowpeas.—The cowpea flourishes in the South, where it gives exceptionally good results as a hog pasture. It is frequently sown among corn with the last cultivation, and pastured after the corn is harvested. The Mississippi Experiment Station (Bulletin 100) reports producing from 350 to 483 pounds of pork from an acre of cowpeas. The peas were allowed to become nearly ripe before the hogs were turned in.

Mixtures.—Various mixtures have been used as pasture crops for swine. The writer has used oats and peas, also a mixture of oats, peas and vetches. These crops do not stand pasturing well, and are better suited for soiling purposes.

The Michigan Experiment Station speaks well of a mixture of corn, peas, oats, rape and red clover. There is a good deal of waste in pasturing this crop. If, however, the first crop would be cut for soiling purposes, the second growth would furnish a good deal of pasture.

Artichokes.—The Central Experimental Farm, Canada, reports good results from artichokes. One-sixteenth of an acre was planted on May 19th with about 70 pounds of tubers. The tubers were planted about four inches deep, in rows 24 inches apart, and in hills about 20 inches apart in the rows. Six pigs averaging a little over 100 pounds each were fed a light meal ration while eating the artichokes. The six pigs gained 197 pounds in three weeks, and consumed only 189 pounds of meal. This is a most extraordinary result, but it must be remembered that the experiment lasted a very short time. The experiment certainly indicates possibilities for this crop. Pigs eat artichokes very greedily.

Pasture vs. Soiling.—Some experiments at the Ontario Agricultural College indicate that more rapid gains with a smaller consumption of food per pound of gain can be secured by soiling pigs than by pasturing. This is especially true of young pigs, and the writer's experience leads him to believe that pigs should weigh at least 100 pounds before being turned on pasture to get best results. There is

considerable extra labor in cutting green crops and carrying them to the pigs under the soiling system, which brings the two systems fairly close together from the standpoint of economy.

Amount of Grain on Pasture.—Growing or fattening pigs cannot be produced satisfactorily on pasture alone, but a grain ration is necessary. The Montana Experiment Station found that hogs fed a full grain ration on pasture gained, on an average, 1.39 pounds per hog per day, and required 412 pounds of grain for 100 pounds of gain. Hogs fed a half ration of grain, gained .98 lb. per hog per day, and required 291 pounds of grain for 100 pounds of gain. Thus, it will be seen that the hogs fed a full grain ration on pasture, made more rapid gains, but consumed much more grain for every 100 pounds of gain.

The Ontario Agricultural College fed two lots of pigs five weeks on clover and ten weeks on rape. One lot received a full meal ration, and the other a two-third meal ration. As in the Montana experiments, the hogs fed a full meal ration made more rapid gains than the others, but they consumed 421 pounds of meal for 100 pounds of gain, as compared with 353 pounds meal for 100 pounds gain in the lot fed the two-thirds ration.

It seems to be clearly demonstrated that it is a mistake to feed hogs all the meal they will eat when upon pasture, unless it becomes necessary to do so near the end of the feeding period in order to fit them for market.

ROOTS.

In Henry's "Feeds and Feeding" there is an excellent summary of Danish experiments with roots for swine. The meal equivalent of roots was found to vary in a very marked degree in different trials, and 100 pounds of barley was found to be equivalent to 600 to 800 pounds of mangels, and 400 to 800 pounds of fodder beets. In the United States and Canada, wide variations in the meal equivalent of roots have also occurred in various tests. The following table gives an idea of the range of values found at several stations:

Central Experimental Farm, ... 100 lbs. meal—786 lbs. roots.
Ohio Experiment Station, ... 100 lbs. meal—642.5 lbs. roots.
Montana Experiment Station, ... 100 lbs. meal—529 lbs. roots.
Utah Experiment Station, ... 100 lbs. meal—455 lbs. roots.
Ontario Agricultural College, ... 100 lbs. meal—441.5 lbs. roots.

The variations in these trials is similar to the variations in the Danish experiments. Ontario obtained a remarkably high meal equivalent for roots, and it is worthy of note that in the Ontario trials the roots were pulped and mixed with an equal weight of meal, the hogs being fed all they would eat of the mixture.

In the writer's experience, hogs fed roots are thriftier looking, and possess better appetites than hogs fed meal alone, and it is no doubt due to their influence upon the general health of the animal that roots are able to make such a favorable showing. The degree to which the general thrift of the animals is injured by exclusive meal feeding will be reflected in the relative feeding value shown by roots and grain, and this fact renders extreme variations quite possible.

Generally speaking, it may be said that sugar beets possess the highest feeding value among ordinary roots, and are most readily eaten by swine. Mangels, Swede turnips and carrots may be counted practically equal in value, but hogs eat mangels with greater relish than they eat turnips.

POTATOES.

At the Wisconsin Experiment Station, 441 pounds of potatoes, cooked and fed to swine, proved equal to 100 pounds of corn meal. In "Feeds and Feeding," Henry summarizes Danish experiments, where 400 pounds of potatoes proved equal to 100 pounds of mixed meal. In connection with these investigations, Prof. Henry says: "In general, we may say that a bushel of corn is worth four and one-half bushels of potatoes for fattening purposes when cooked and fed with corn meal. Potatoes may have a higher value than the rating here given, in furnishing variety in ration to growing animals."

Potatoes must be cooked for swine, and this item of expense cancels some of the advantages which they possess over roots as a food for swine.

PUMPKINS AND SQUASHES.

Pumpkins belong to the same class of foods as roots, giving bulk and succulence to the ration, and thus promoting thrift. J. H. Grisdale,, Central Experiment Farm, has a high opinion of pumpkins for swine. He says: "We cook them and mix meal with them and I don't think there is anything that will surpass them as a cheap fattening ration." He also states that the pigs like the seeds best, and that no injury comes from feeding the seeds. Excellent results were obtained at the New Hampshire Experiment Station from feeding raw pumpkins with meal and skim milk.

The squash may be counted as equal to the pumpkin in feeding value.

APPLES.

Apples do not ppear to possess a high feeding value, but may often be used to good advantage to give variety and succulence to a ration. They are, perhaps, most suitable for mature breeding stock, but a hog should never be expected to subsist upon apples as the main part of its ration.

DAIRY BY-PRODUCTS.

Skim Milk.—The results of nineteen trials with eighty-eight pigs at the Wisconsin Experiment Station are well summarized by Henry in "Feeds and Feeding." It is a well known fact that when a small proportion of skim milk is fed with meal, the milk shows a higher meal equivalent than when a large proportion is fed; that is to say, it requires a smaller amount of skim milk to be equivalent to a given amount of meal when a small proportion of milk to meal is used. Henry summarizes the Wisconsin results as follows:

Proportion of Milk to Meal.	Pounds Milk Equivalent to 100 Pounds Meal.
1 lb. corn meal, 1 to 3 lbs. milk.	327 lbs. milk equals 100 lbs. meal.
1 lb corn meal, 3 to 5 lbs. milk.	446 lbs. milk equals 100 lbs. meal.
1 lb. corn meal, 5 to 7 lbs. milk.	574 lbs. milk equals 100 lbs. meal.
1 lb. corn meal, 7 to 9 lbs. milk.	552 lbs. milk equals 100 lbs. meal.
Average of 19 trials.	475 lbs. milk equals 100 lbs. meal.

The Ontario Agricultural College reports a trial in which 355.6 pounds of skim milk proved equal to 100 pounds of meal. The proportion of milk to meal was about 2.5 to 1, and the result is similar to the Wisconsin result with a similar proportion of milk to meal.

The Minnesota Experiment Station reports six trials in which the proportion of milk to meal varied, the highest proportion being about 5 pounds of milk to one of meal. The average of these trials gives 467 pounds of milk equivalent to 100 pounds of meal, which is very close to the Wisconsin average.

Utah experiments show 431 pounds of skim milk equal to 100 pounds of grain, and Tennessee experiments 476 pounds of skim milk equal to 100 pounds of grain. The Tennessee results are practically identical with the Wisconsin average, and the Utah results are reasonably close.

These experiments show that where skim milk can be obtained conveniently and in suitable quantity, it has a very considerable value in hog feeding. When meal is worth $20.00 per ton, skim milk is easily worth 20 cents per hundred pounds, unless an exceptional amount of labor is involved in procuring it. For young pigs, just after weaning, it is difficult to find a substitute for skim milk, and in such cases its value would be very much higher than for older hogs.

Sweet vs. Sour Skim Milk.—Several experiments with sweet and sour skim milk indicate that there is little or no difference in the feeding value of the two products, in fact, the sour milk has, if anything, had the advantage. For very young pigs, sweet milk is preferable.

Whey.—At the Ontario Agricultural College, the writer conducted seven trials with a view to ascertaining the value of whey for pig feeding. The average of these seven trials gives 744.5 pounds of whey equivalent to 100 pounds of meal.

Two trials at the Wisconsin Experiment Station give an average of 800 pounds of whey equivalent to 100 pounds of meal.

These trials probably show the maximum value of whey for pig feeding. Under ordinary methods of feeding it would hardly be safe to expect quite as good returns for whey. Where labor is involved in procuring the whey, due allowance must be made in estimating the value of this product.

Sweet vs. Sour Whey.—Five trials made by the writer failed to show any appreciable difference between the feeding value of sweet and sour whey.

Separated vs. Ordinary Whey.—In an experiment conducted by the writer, ordinary whey proved to be worth twenty-five per cent. more than separated whey. The separated whey had been run through the cream separator to remove the fat for making whey butter.

Buttermilk.—Experiments at the Ontario Agricultural College an elsewhere show that buttermilk is practically equal to skim milk for feeding pigs.

Substitutes for Skim Milk.—For young pigs, just after weaning, it is difficult to find anything that will take the place of skim milk. When skim milk is not available, there is danger of the pigs becoming stunted at this period of their life, especially pigs that are weaned young. The Ontario Agricultural College conducted two trials with Swift's digester tankage and blood meal as substitutes for skim milk. These two foods proved nearly equal in value, and since the tankage costs much less per ton, it was regarded as the most satisfactory.

In the first trial, the tankage constituted about one-fourteenth of the total ration, and in the second trial one-tenth of the total ration.

About two pounds of milk to one pound of meal was fed in each trial.

The average of the two trials shows that to produce 100 pounds of gain, it required:

375 pounds meal and 34 pounds tankage.

390 pounds meal and 727 pounds skim milk.

The pigs getting tankage ate their food quite as eagerly as those getting skim milk, and continued thrifty throughout the experiment.

Tankage, therefore, proved a very satisfactory substitute, so far as gains in weight were concerned, but when skim milk can be obtained at 15 cents per hundredweight, it is cheaper than tankage at prevailing prices.

In other experiments by the writer, the results of which have not been published, other substances, such as linseed meal, "black strap" molasses, and tea from alfalfa hay have been tried, but none of these approached tankage in efficiency as a substitute for skim milk for young pigs.

The Michigan Experiment Station also compared tankage with skim milk for young pigs. The pigs on skim milk made slightly larger gains, but when skim milk was valued at 20 cents per 100 pounds, and tankage at $1.62\frac{1}{2}$ per 100 pounds, the tankage fed pigs made cheaper gains than the skim milk pigs.

PREPARATION OF FOOD.

Cooking and Steaming.—Years ago there was a popular belief that cooking or steaming feed increased its digestibility, and hence its feeding value. The work of experiment stations and private investigators has thoroughly exploded this idea, and indicates that digestibility may be decreased rather than increased by cooking, in the case of many foods. There are some foods which are rendered more palatable by cooking, such as potatoes and beans, but in the case of foods which are eaten readily without cooking, it may be taken as settled that cooking or steaming is poor economy. Instead of being a commendable practice, cooking is something which should be avoided as far as circumstances will permit, and employed only when foods are not acceptable in the raw state. Where economy is no object, it may be possible to secure larger gains in weight by cooking a certain portion of the food to make the ration more palatable, thus stimulating the appetite of the animal, but such gains are usually obtained at a comparatively high cost.

Grinding.—The question of grinding was discussed under corn, and it was shown that, so far as corn is concerned, the gain from grinding is comparatively small. Numerous experiments have been made with other grains to determine the effect of grinding, it being generally supposed that grinding would be more effective in the case of small grains than it would be with corn. It is out of the question to review experimental work in detail in regard to this point, but it may be said that grinding small grains, such as peas, barley, oats and rye, has almost invariably proved beneficial. Sometimes the advantage of the ground grain has been very slight, and sometimes very marked, but the general evidence indicates that it is advisable, when practicable, to grind such grains. When the cost of grinding is excessively high, the practice may not be advisable, but, under ordinary circumstances, it is the safe course. According to a compilation of experiment station results, made by G. M. Rommel

(Bulletin 47, U. S. Dept. of Agric.), the average saving effected by grinding small grains is 12.26 per cent., which is double the saving effected by grinding corn in the Wisconsin experiments.

Wet vs. Dry Food.—Considerable experimental work has been done with wet and dry food, and results are very contradictory. On the average, the two methods of feeding show practically equal results. The writer's experience is that when hogs can be fed dry meal in such a manner that they cannot waste it, they make as good use of it as when it is wet. There is more tendency to waste feed when it is fed dry, especially when a considerable number of hogs are fed out of the same trough. Troughs arranged so as to prevent crowding, will tend to lessen the waste. In cold pens, dry meal feeding has some advantages, and mixing dry meal with an equal weight of pulped roots makes a good ration. Under ordinary conditions, it is difficult to see much advantage from dry feeding.

Soaking.—Soaking feed is another practice which seems to give variable results according to experimental data. There seems little doubt, however, that in the case of dry, hard grain fed whole, soaking is to be commended. In the case of meal, freshly mixed food will likely give as good results as soaked food.

Fermenting.—The practive of fermenting food for swine used to be much more common than it is at present. In the case of cottonseed meal, it will be remembered that the Texas Station recommends mixing the cottonseed meal with other meal, and allowing the whole mass to sour. The New Hampshire Station obtained better results from fermented bran than from unfermented bran. With foods well adapted to pig feeding, it is not likely that fermentation would be of any benefit.

COST OF RAISING PIGS.

The Ontario Agricultural College obtained some interesting figures relative to the cost of raising young pigs until six weeks old, at which age they were commonly weaned.

Foods were valued as follows: Meal of all kinds, including bran and middlings, $20.00 per ton; roots, $2.00 per ton; skim milk, 15 cents per 100 pounds.

It is assumed that the sow raises two litters a year, and that she nurses each litter six weeks. This would leave about nine and one-quarter months during the year that the sow would not be nursing pigs, and the cost of maintaining the sow during the time she is dry is estimated at 75 cents per month, it being assumed that the sow is fed as economically as possible during this time. The maintenance during the nine and one-quarter months at 75 cents per month

amounts to $6.94, or in round numbers, $7.00. Half of this amount, or $3.50, is charged against each litter, in addition to the cost of food consumed by the sow and pigs before the pigs are weaned.

Risk, interest on investment, labor and manure are left out of the calculation.

Twelve litters of pigs were used, which were weaned at six weeks old in each case.

The following table gives particulars of each litter:

Sow and litter.	Number of pigs in litter.	How Bred.	Cost of feeding sow and litter for six weeks.
No. 1,	4	Pure Yorkshire,	$3 20
No. 2,	9	Berkshire sire, Tamworth dam,	3 08
No. 3,	6	Pure Yorkshire,	3 87
No. 4,	5	Yorkshire sire, Tamworth dam,	3 70
No. 5,	8	Yorkshire sire, Tamworth dam,	3 04
No. 6,	3	Yorkshire sire, Berkshire dam,	5 85
No. 7,	9	Berkshire sire, Yorkshire dam,	4 31
No. 8,	8	Pure Yorkshire,	4 33
No. 9,	8	Pure Tamworth,	3 88
No. 10,	8	Yorkshire sire, Tamworth dam,	3 94
No. 11,	6	Tamworth sire, Berkshire dam,	3 33
No. 12,	4	Tamworth sire, Berkshire dam,	2 37
Average,	6½		$3 74

To arrive at the total cost of the pigs at six weeks old, the service fee, and half the cost of maintaining the sow when dry are charged against the average cost of maintaining the sow and litter for six weeks, making the total cost as follows:

Service fee,	$1.00
Half cost of maintaining dry sow (½ of $7.00),	3.50
Average cost of food for sow and litter,	3.74
Total,	$8.24

Average number of pigs in litter, 6½.

Average cost per pig six weeks old, $1.27.

If the cost of maintaining the dry sow were placed at $1.00 per month, it would bring the cost of the young pigs to $1.44 each at six weeks old. It is probably a safe statement, therefore, that young pigs can be raised to the age of six weeks at $1.50 each, making some allowance for items not considered in the experiment described.

J. H. Grisdale, Central Experimental Farm, Canada, estimates that a breeding sow can be maintained during a whole year at from $12.00 to $15.00, under careful management, and produce two litters

during the year. This approximates, very closely, the Ontario results, which, omitting service fee, make the cost of maintaining a sow half a year, and one litter of pigs for six weeks, $7.24.

MONEY RETURNS FOR FOOD CONSUMED BY HOGS.

Some interesting figures have been published by the Ontario Agricultural College relating to the value it is possible to obtain for food consumed by hogs, when the hogs are sold at varying prices per pound live weight. The investigation includes hogs fed by the College, as well as a large number fed by farmers throughout the province. The following summary shows the scope of the investigation:

Number of hogs,	297
Weight when marketed,	56,718 lbs.
Average weight per hog,	190.9 lbs.
Total meal consumed, which included barley, peas, oats, corn, middlings, and bran,	165,911 lbs.
Total skim milk consumed,	112,500 lbs.
Total roots consumed,	64,600 lbs.
Miscellaneous foods, such as pasture, green foods, etc., valued by experimenters at	$77.00

The pigs are valued at $1.50 each at weaning time. This amount, together with the value of the skim milk at 20 cents per cwt., roots at 10 cents per bushel, and the miscellaneous foods valued at $77.00 is first deducted from the gross proceeds derived from the assumed sale of the hogs at each of the different prices per pound, and the residue represents the cash received for the meal consumed by the hogs. The following table shows the prices obtained for feed, under each valuation of the hogs when sold:

PRICES REALIZED FOR FOODS CONSUMED BY 297 HOGS.

Assumed Selling Prices of Hogs, Live Weight.	Meal, grain, mixed and middlings including bran.	Milk.	Roots.
	Per ton.	Per cwt.	Per bu.
If sold at 4½ cents per pound,	$20 45	$0 20	$0 10
If sold at 5 cents per pound,	23 87	20	10
If sold at 5½ cents per pound,	27 29	20	10
If sold at 6 cents per pound,	30 71	20	10
If sold at 6½ cents per pound,	34 13	20	10

Figures such as the above, obtained from a large number of hogs fed under varying conditions, carry considerable weight. They show that the hog is able to give a good account of the food he consumes, provided he is handled with intelligence. Of course, the figures in the table are averages. Some experiments showed larger returns, and some did not show as large, but it is worthy of note that two experiments which showed exceptionally good results were omitted from the computation in order to make the results as conservative as possible.

FEEDING AND MANAGEMENT.

THE BOAR.

Use.—The age at which a young boar may be first used depends largely upon his development. Some boars may be used to a few sows when not more than seven months old, without apparent injury. As a rule, it is safer not to use a boar before he is eight months old, and to use him as sparingly as possible until he is a year old. No hard and fast rule can be laid down and the owner must use his judgment in the matter. Excessive use when young is likely to shorten the period of a boar's usefulness, and since a boar will usually leave the best pigs after he reaches maturity, the importance of saving him while he is young will be readily appreciated. Some good breeders will not allow more than one service a day, with intervals of one or two days a week without being used, in the case of valuable boars. This is a matter which can be regulated better in large herds where several stock boars are kept, than it can where only one boar is kept, and where outside sows are admitted. The owner of a boar under the last named conditions will require to exercise all his ingenuity to prevent his boar from being used too freely during certain seasons of the year. In no case should more than one service to a sow be permitted, and the boar should not be allowed to run with sows to which he is to be bred. Excessive use is likely to result in small, weak litters, and the aim should be to save the boar from all unnecessary service. It is not good to use a boar immediately after he has been fed.

Exercise.—Probably nothing is more essential to the health and vigor of an animal than exercise. In summer, it is usually a comparatively simple matter to provide exercise in a paddock or pasture lot, but in winter it is more difficult. A roomy pen should be provided, with a sheltered outside yard. When practicable, it is a good plan to feed the boar outdoors at some distance from his sleeping

quarters, thus compelling him to take exercise in walking back and forth between his pen and the feeding place. Icy ground is the greatest drawback to this method, but this can be overcome by littering the walk with some strawy horse manure. Sometimes the boar can be fed in a well littered barnyard, which makes a very good arrangement when practicable. When several boars are kept, it is difficult to provide separate runs for each boar, and it simplifies matters if they are taught to run together. The tusks should be removed and a cool day should be selected for turning them together for the first time. It takes a very short time, as a rule, to settle the questions of supremacy, and when once settled no further disputes arise. The writer has had considerable experience with this method, and has never known bad results to follow. Two conditions are necessary, the tusks must be broken off, and a cool day selected for the tournament. After the first struggle, the boars will live together as peaceably as sows.

Removing Tusks.—Armed with long, sharp tusks, the boar is capable of inflicting serious injury upon man or beast, should he take the notion, but, deprived of his tusks, he becomes comparatively harmless. It is the part of wisdom, therefore, to remove these tusks before any damage is done, because we never know what the quietest boar may do under provocation. Several methods may be employed, and the following one will answer very well. The boar is first made fast to a post by means of a rope noosed about his upper jaw back of the upper tusks. Then, one man takes a crowbar and another a sharp cold chisel and a hammer. The sharp edge of the crowbar is placed against the tusk near its base, and held firmly in position, and the edge of the cold chisel is placed on the opposite side of the tusk directly opposite to the edge of the crowbar. A sharp blow with the hammer on the cold chisel does the job.

Feeding.—It requires good judgment to keep a boar in the best possible condition. Extremes are to be avoided. The over-fat boar does not make a satisfactory sire, as a rule, and a half-starved boar cannot transmit vigor and constitution to his progeny to the same degree that he would if properly managed. To get the best results, the boar should be in fair flesh. A reasonable amount of fat on his bones will do him no harm if he gets sufficient exercise.

An exclusive meal ration will not give good results, especially if the ration is made up of corn. It is true that corn can be fed to a boar without injuring him, but it must be fed in the right way. Corn is fattening, but its exclusive use is debilitating, and the feeder must combine something with it to get good results. Equal parts ground corn, ground oats, and wheat middlings, make a good meal ration. Equal parts ground oats and middlings, make a first-class meal ration when corn is not used. It gives sufficient bulk, and is nutritious with-

out being heating, or too fattening. Ground oats, middlings, or bran may be used singly to dilute corn; in fact, a very great variety of grains may be fed, so long as the feeder uses judgment.

But a boar needs something besides meal if he is going to do his best. Skim milk and buttermilk are excellent, and will give good results with corn though nothing else may be used. In winter, roots of any kind are much relished. They have a cooling, laxative effect, preventing constipation and keeping the animal thrifty and vigorous. If roots are not available, alfalfa hay of fine quality, or even fine red clover hay may be used to give bulk to the ration. Some feed the alfalfa hay dry in racks, and others prefer to cut it and soak it with the meal ration, or scald it with boiling water before mixing with the meal. As a substitute for roots, the soaked or steeped alfalfa would be preferable to the dry hay. Alfalfa or clover hay may be fed along with roots, and will be found to give good results if the feeder takes care to supply a reasonable amount of concentrated food to make the ration sufficiently nourishing.

Summer management is usually simpler than winter. A pasture lot provided with shade is one of the best places to keep a boar. The grass or clover, or whatever the pasture may consist of, will furnish the bulky, succulent food necessary for health, and gathering part of his food from pasture compels the boar to take exercise. If it is not possible to provide pasture, he should be liberally supplied with green food in his pen.

The quantity of meal to feed a boar will vary with circumstances. During the season when he is used most, he will require liberal treatment, but at no time should he be fed more than he will eat up clean before leaving the trough. During comparatively idle seasons, a very light meal ration will be sufficient, and if on good pasture, he will require but little food in addition. It is entirely a matter of judgment, and the feeder must be guided by the condition of the boar. It is never wise to make sudden changes in the ration, that is, to change suddenly from a light ration to a heavy one, or from a heavy ration to a light one. Changes should be made gradually and the feeder, knowing about when the heaviest season commences, should start in plenty of time to prepare the boar for it.

THE SOW.

Age of Breeding.—The age at which a young sow is first bred will depend upon her development, but it is very seldom that it is advisable to breed her before she is eight months old. Many good breeders prefer not to breed sows before they are ten, or even twelve months old, and if they are intended for show purposes, it is scarcely advisable to breed them earlier. One of the great objections to breeding sows very early is the fact that the very young sow is seldom

able to raise a fair sized litter of pigs, and if she raises only a few pigs in her first litter her mammary glands do not develop properly, and she rarely makes as good a nurse with subsequent litters as the sow which raises a good sized first litter. Another objection to early breeding is the fact that the very young sow has not the strength to stand the strain of nursing a litter of pigs, and her vitality is sapped to such a degree that she never develops as she should. As a result, she will not retain her usefulness for so long a period, nor is she so likely to give strong, vigorous litters as though she had possessed more maturity before being bred.

Breeding Mature Sows.—Many sows will accept service a few days after farrowing, but it is hardly necessary to say that to breed a sow at this time is bad practice. No sow can do justice to herself and two litters of pigs at the same time, and the man who attempts to gain time by following such a practice will surely lose by it in the end. Usually, the sow may be bred again a few days after her pigs are weaned, if not too much pulled down in condition by nursing. If she has raised a large litter and is very much emaciated, the chances are that she will produce a small litter the next time, if she is bred immediately after the pigs are weaned. In such cases she should be given three weeks or a month of liberal feeding to enable her to regain something of her lost strength and vitality before she is bred. Though the sow need not be fat, she should be in good heart and thriving at the time she is bred. Many a man has been puzzled to know why his sow, which had raised a large litter, should drop down to four or five pigs the next time. The reason is not difficult to find, because a sow must be strong and full of vitality at the time of service in order to produce a large, vigorous litter.

Period of Gestation.—The period of gestation in sows is usually placed at 112 days. Often, young sows will farrow a few days sooner than the stated time, and old sows will frequently go a few days over it. It is not a good sign when a sow goes much over the sixteen weeks, as the litters are often lacking in vitality when carried much over time. If a sow has been properly handled, she will seldom go more than a few days over sixteen weeks, though there are exceptions to all rules.

Best Time for Farrowing.—Where winters are at all severe, it requires exceptional skill and equipment to make a success of winter litters. Most farmers will find it safer to have their sows farrow in April and October. It is generally possible to give April pigs a little outdoor exercise at an early stage of their growth, which will be found a great help in keeping them healthy and thrifty. The October pigs will also be able to get outdoor exercise for a time, which will enable them to get a good start, and make them better able to endure the closer confinement necessary during winter.

One or Two Litters.—The man who is breeding for show purposes, and who wishes to have his pigs on the sow as long as possible, as well as get his sow into high condition between litters, will find it necessary to breed his sows only once a year; but the general run of farmers will require their sows to do more than this, and there is no good reason why a sow should not produce two litters a year when properly handled, provided that the sow is not to be fitted for the show ring.

Exercise.—Though exercise is important in the case of the boar, it is doubly important with sows during the period of gestation. Without considerable exercise during this time, sows cannot be made to give satisfactory results. In summer, pasture should be provided in which there is plenty of shade. A good pasture affords ideal conditions for sows, the green food and the exercise keeping the sows in the best possible condition.

The greatest difficulty will be encountered in giving the sows sufficient exercise during the winter. Where only a few sows are kept, it is often possible to give them the run of a barnyard, where they will take exercise rooting among the manure, or working among scattered straw or chaff to find what little grain it may contain. If a dry, well bedded sleeping place is provided, which is free from draughts, the conditions are about as good as can be obtained. When it is impossible to use the barnyard, a roomy shed with earth floor and a sleeping place arranged in one corner, can be made to answer the purpose very well. By littering the shed with cut straw or chaff, and sprinkling a very little whole grain among the chaff every day, the attendant can induce the sows to take considerable exercise. Another method is to use portable pens set in outside lots. The pens should be placed facing south, and fifty yards, or more, from the feeding place. If kept well bedded, and banked about the bottom with strawy horse manure, they make comfortable sleeping quarters. The sows are forced to take exercise in walking backwards and forwards between the pen and the feeding place. It is better to keep not more than five or six sows in a pen of this kind, and care should be taken to provide plenty of trough room. The troughs should be placed on dry ground, or on a platform, and it is preferable to have them in a place that is sheltered from the wind.

Feeding and Management During Gestation.—During the period of gestation the sow should be kept in good, strong condition, but not overloaded with fat. Extremes in condition are to be avoided. The very fat sow is apt to be clumsy with her pigs, and sometimes her pigs are few in number or lacking in vitality. On the other hand, the very thin sow will either not do justice to her pigs, or will become a mere wreck herself during the time she is nursing her litter,

and the chances are that both these things will happen. A sow may be kept in fairly high condition and still produce satisfactory litters, provided she takes plenty of exercise.

In districts where corn is plentiful, there is a temptation to feed sows almost exclusively upon corn. Such a method of feeding cannot give the best results, besides corn does not furnish enough bone and muscle forming constituents to properly develop the unborn pigs. It is also rather too fattening and heating to feed in large quantities to a sow at this stage. It is true that corn may be fed, but, as in the case of the boar, it must be fed with judgment. The ration recommended for the boar, namely, equal parts ground corn, ground oats, and wheat middlings, will answer very nicely for the sow. The proportion of corn is better to be not over one-third of the meal ration, and wheat middlings or bran may be used to dilute the corn meal without oats. In cold weather, if sows have a good deal of outdoor exercise, they may be fed more corn with safety than when they are kept pretty closely confined. A meal ration which is preferred by the writer to all others, is equal parts ground oats and middlings, leaving out corn altogether. It is possible, however, to use a wide variety of foods, so long as the feeder realizes the importance of furnishing considerable bulk, and of restricting the proportion of heating or highly fattening foods.

As in the case of the boar, the sow requires something besides meal, and the furnishing of some such foods as roots, or alfalfa or red clover hay, is even more important than in feeding the boar. Skim milk is also excellent, but is not often available for sows.

In summer, a pasture field will furnish the bulky part of the ration, and if sows are in good condition to start with, and are given a good pasture, they will get along very well without other food for two or three months. They should be given a little meal for several weeks before farrowing to accustom them to its use, and render the change less violent when they are taken into the pens. With regard to the quantity of meal, the feeder must be guided entirely by the condition of the sows.

Meal may be fed either wet or dry. When roots are fed, a good plan is to mix the dry meal with pulped roots, though the feeder has wide latitude in regard to the methods he may see fit to follow. When sows are fed outdoors in cold weather, very little water should be used in mixing their feed. It will be found better to furnish them with water separately, should they require it. If they are fed roots, they will take very little water in cold weather. It should be seen to, however, that they have water when they need it, and in hot weather, an abundant supply of fresh water is very important.

A record should be kept of the date of service of each sow, so that the date of farrowing will be known in advance, and due precaution taken. A week or two before farrowing, the sow should be

placed in the farrowing pen so as to become accustomed to her surroundings and changed conditions before the pigs are born. Constipation is the bane of the swine breeder, and if the sow becomes constipated before she farrows, the chances are that she will lose her pigs, and possibly her own life. Constipation, therefore, is one of the main things to be guarded against at this time. When it once occurs, very little can be done to successfully overcome it and save the pigs, so that it is almost altogether a matter of prevention. If a sow is taken directly from a pasture field, shut up in a pen, and fed upon an exclusive meal ration, trouble is almost sure to occur. Radical changes in feeding are to be avoided, and the ration should be kept practically the same after taking the sow into the pen as it was before. If anything, the food should be made rather more sloppy, and green feed or roots should be supplied the same as they were before the sow was taken in. A small amount of linseed meal (oil meal) or ground flaxseed added to the ration is also helpful in preventing constipation. The wisdom of feeding sows meal on pasture for a time before they farrow can be readily appreciated, as it prevents a violent change in their ration. The sow should also be given a chance and encouraged to take exercise.

The farrowing pen should be dry, well ventilated, and free from draughts. It is a good plan to provide the pen with a guard rail made of two by eight inch planks fastened with their edges against the sides of the pen adjacent to the bed. These prevent the sow from lying against the partition, and lessens the danger of injury to the little pigs, which often find the space under the guard a very convenient refuge. There is a difference of opinion as to the amount of bedding which should be used, some maintaining that the sow should be liberally supplied with bedding, and others that the bedding should be limited. The writer's experience is that active sows in comparatively light condition can generally be trusted with a liberal amount of bedding, but sows which are in high condition, or which are at all clumsy, had better be given only a moderate amount of straw. Sows should not be allowed to farrow in a large piggery where many other pigs are kept, unless it is warm weather and windows and doors can be left open. The air of a piggery where many pigs are kept seems to be poisonous to little pigs, when the weather is cold and the doors and windows have to be closed, in spite of ordinarily good methods of ventilation. The writer has had good results from sows farrowing in portable single pens placed in a sheltered yard, even in zero weather. Tarred paper was put on the studding, and the pen tightly boarded outside and inside. A ceiling of slats was put in the pen, and the space above the ceiling stuffed with straw. A window in the side, a small ventilator running from the ceiling out through the roof, and a lighted lantern hung

in the pen on the coldest days when the pigs were very small, completed the equipment. The air in this pen always felt dry and comfortable, and the pigs all kept healthy and thrifty.

It pays to treat sows kindly and to have them quiet. If they are on good terms with the attendant and regard him as a friend, there is much less danger of trouble from nervous, excited sows when the critical time of farrowing arrives.

Feeding and Management After Farrowing.—After farrowing, the sow should not be disturbed, and if she lies quiet for ten or twelve hours, or even more, so much the better. When she wants anything, she will come to the trough for it. At first, she should have little more than drink. A very thin slop of middlings and water will answer very well. If the weather is cold, tepid water should be used. During the first three days great care must be exercised not to overfeed, and the ration should be very light. After this, the food may be gradually increased, taking a week or ten days to reach full feed. A good mother with a large litter requires very liberal feeding, but if the litter is small, it may be necessary to reduce the feed.

Many different rations are used for nursing sows. Equal parts of finely ground oats and wheat middlings, allowed to soak between feeds, makes a most excellent ration. If sweet skim milk can be added to the mixture, it makes an almost ideal ration. Corn may be used as recommended for sows before farrowing, and in larger quantities if skim milk is available. A certain amount of roots and green feed are always in order, but the sow should not be expected to subsist upon such foods at this time. A limited amount of bulky, succulent food helps to keep the sow healthy.

If the sow's udder becomes hard and inflamed, it is a good plan to bathe thoroughly with hot water, and apply equal parts of lard and turpentine.

When the pigs are weaned, the food should be cut down to check the secretion of milk. Dry oats make a safe food for the sow for a few days after the pigs are weaned. If the udder gets very full, it is a good plan to turn the sow in with the pigs once a day for a few days.

Sows Which Eat Their Pigs.—Occasionally a sow will be found which will eat her pigs. It is claimed by some that the tendency to eat their young is sometimes caused by allowing sows to eat the afterbirth. As a precautionary measure, the afterbirth should be promptly removed from the pen, but there is little doubt that the trouble is generally caused by a fevered condition in the sow, often induced by injudicious feeding before farrowing, or even after farrowing. A remedy that has been suggested is to feed the sow salt pork, but the danger is that once the sow has eaten her pigs she acquires the

habit and is likely to do it again. Unless she is a very valuable sow, it is safer not to give her a second opportunity, but to turn her into the feed lot and fatten her for the butcher.

THE YOUNG PIGS.

Feeding and Management Before Weaning.—When the pigs are born the attendant should be on hand to see that everything goes well. If the pigs are strong, and the sow lies quiet, it is better not to interfere. Sows that have been properly fed and given sufficient exercise seldom have difficulty in farrowing. If the pigs seem somewhat weak, or if the sow is very restless, it is safer to place the pigs in a well bedded box or basket to keep them out of the way until all are born. If the pen is chilly, a bottle of hot water placed in the bottom of the basket and covered with a blanket, with another blanket over the top of the basket, will help keep up the vitality of the pigs. The pigs should be placed to the teat to suck as soon as possible. The weaker the pigs, or the colder the pen, the more important an early drink of the mother's milk becomes. If parturition is not unduly protracted, and if the pigs are strong, lively and comfortable, they may wait for their first drink until all are born, but in such matters the attendant must use his judgment. In cases of difficult parturition, a pig that is apparently lifeless can often be revived by opening his mouth and blowing into it. To be successful, this operation must be performed as soon as he is born. A chilled pig can sometimes be revived by immersing up to the neck in water heated to the temperature of about 98 degrees. When removed from the water he should be rubbed dry, and induced to suck if possible. As soon as the sow appears to have settled down quietly, it is best to put the little pigs with her and leave them together. It is well not to interfere except when it is absolutely necessary.

By the time the pigs are about three weeks old they will have learned to eat. If at all possible, it is a good plan to give them access to another pen in which is kept a small trough. Here they can be fed a little skim milk with a very little middlings stirred into it. The quantity of middlings can be increased gradually as the pigs grow older. If they can be taught to nibble at sugar beets or mangels during this time, so much the better. A small amount of soaked whole corn, or almost any other grain, scattered on the floor of the pen, will cause them to take exercise while hunting for it. If it is not possible to provide an extra pen, the sow may be shut out of the pen while the pigs are being fed. Many people simply allow the young pigs to eat with the sow, and many good pigs are raised in this way, but better results will be obtained if the pigs can be fed separately.

Exercise is very important for young pigs, and every possible means of securing it must be adapted. If they are kept in a small pen with the mother, some of the best of them will likely become too fat, and will probably sicken and die. Outdoor exercise is especially beneficial, but the pigs should be protected from cold winds, or from a very hot sun. If the sow is turned out with her pigs, it is not well to give her a very large range at first, as she is likely to travel too far and unduly tire the pigs.

Boars not intended for breeding purposes should be castrated before weaning to get the best results, though there is not much danger from castrating at a later date provided care is exercised in connection with the operation. Clean hands, a clean knife, and the use of a disinfectant upon the wound, will obviate practically all danger.

Feeding and Management After Weaning.—There is considerable difference of opinion as to the best age at which to wean pigs. Some advocate leaving the pigs with the sow for ten or twelve weeks, in fact, the sow is allowed to practically wean her own pigs. For producing show pigs, this method may answer very well, but it means only one litter a year; at any rate, it does not admit of two litters a year, and the average farmer will find it more profitable to wean his pigs early enough to permit two litters to be raised. If the young pigs have been taught to eat as described, and skim milk is available, they may be weaned successfully when six weeks old. It is true that many pigs are weaned before they are six weeks old, but it is seldom advisable to do so if they appear to be thriving upon the sow. If skim milk is not available, it is generally advisable to defer weaning for two weeks more, and special pains should be taken to have the pigs well accustomed to their new feed and eating heartily before they are weaned.

Skim milk and middlings make about the best food for young pigs after weaning. If the middlings are fine and floury, which is not too likely to occur under present day methods of milling, they will sometimes cause indigestion, which may show itself either in the form of diarrhoea or constipation. Diluting the middlings with a little bran or finely ground oats will help prevent the trouble. Soaking or scalding the middlings will also tend to prevent digestive troubles. Scalding the middlings is especially useful when no skim milk is to be had, as it makes the food more palatable. To scald the middlings, it is best to pour boiling water on them, cover the vessel, and allow to stand several hours, or from one time of feeding until the next. When the pigs are first weaned, it is better to feed four times a day, giving only a small quantity of food each time, and taking care to keep the trough clean. When well started, they may be changed to three feeds a day.

It is not well to be in a hurry to commence feeding corn, but if skim milk is fed, corn feeding may commence earlier than when no skim milk is available. Generally speaking, when pigs are about three months old, a little corn or other grain may be introduced into their ration. Two parts of middlings and one part of corn meal or ground barley, mixed with skim milk to form a slop, makes an excellent ration for growing pigs. As the pigs grow older, the proportion of grain to middlings may be increased, but at no time should they be fed exclusively, or almost exclusively upon corn, because corn is a poor bone and muscle former. The importance of feeding supplementary foods with corn has been pretty fully discussed under the work of experiment stations, and need not be dwelt upon here. A few roots will be found most helpful in keeping young pigs healthy during the winter, and green food of almost any kind will answer the purpose during the summer. The feeder has a wide range of foods to choose from, and if he understands something of their nature, he should have no difficulty in compounding a ration which will give satisfaction. The aim should be to develop bone and muscle during the early stages of growth, and while the pigs should be thrifty, and sleek in the hair, they should not be fed in such a way as to overload them with fat. This is especially true of pigs which are intended for breeding purposes, and which should be carried right through to breeding age upon foods which stimulate growth and general vigor rather than fat. A reasonable amount of fat is not objectionable, but the development of the frame, the muscular system, and the vital organs must not be neglected, if a satisfactory breeding animal is to be produced. Variety in foods and plenty of exercise are very essential features in raising an animal that will possess all round development.

FATTENING.

Many of the problems connected with the fattening of hogs are discussed under experiment station work. Corn may be used much more freely for fattening hogs than for those intended for breeding, but experiments show conclusively that corn has its limitations, even for fattening, and that it is greatly improved by having some food richer in protein combined with it. The importance of using some sort of supplementary food with almost any meal ration in order to give bulk and variety has also been demonstrated, and the important place which pasture may play in the fattening of hogs has been quite fully dealt with. Little remains to be said under this heading, therefore, except a few general facts of more or less importance.

Winter Feeding.—Generally speaking, winter feeding is more expensive than summer feeding. Part of the extra food required in winter is probably due to the fact that more food is required to keep up the heat of the body during cold weather. There is little doubt, however, that much of the advantage of summer feeding is due to more sanitary surroundings, that is, more fresh air and outdoor exercise, coupled with more succulent food, which seems to aid digestion. The man who feeds hogs in winter, therefore, should aim to approach summer conditions as nearly as possible. He cannot get summer temperature, it is true, but he can provide a fair amount of fresh air, and foods that will keep the digestive organs in good condition. It is just here that the man who grows a few roots for winter feeding has a great advantage over the man who does not. Skim milk, buttermilk, and alfalfa hay may also be made to perform a useful part in giving variety and aiding the digestive organs to perform their functions properly.

Quantity of Feed.—The test of the skill of the feeder is his ability to keep just slightly within the appetite of the animals under his charge. He must watch the animals closely and see that they clean up with apparent relish all that he gives them. Food left in the trough is a sign that something is wrong with the methods employed, and to have to cut back in the quantity of food means a loss of time. The quantity should be so gauged that there is a gradual increase as fattening advances, and radical changes, either in quantity or kind, should be avoided. To be successful, the feeder must learn the lesson that all changes should be made gradually, and that undue haste in fattening may mean serious delay in the process, together with a waste of food.

Regularity and Comfort.—Regularity in time of feeding is necessary to regularity in the appetite of the animal. The animal which is fed at the same hour every day will take more food with less danger of surfeiting than the one fed at any time to suit the convenience of the feeder.

Dry, comfortable quarters, and sanitary conditions generally in pen or feed lot, are important factors in securing satisfactory gains, and in avoiding disastrous loss through disease.

Cost Increases with Age.—Prof. Henry in "Feeds and Feeding" gives a very instructive table compiled from results from numerous experiment stations, showing the food consumed per 100 pounds gain by hogs of different weights. Following is an abbreviation of the table as given in Professor Henry's book:

Weight of Animals in Pounds.	Total number of animals fed.	Average feed eaten per day.	Feed eaten daily per 100 pounds live weight.	Average gain per day.	Feed for 100 pounds gain.
15 to 50,	174	2.23	5.95	.76	293
50 to 100	417	3.35	4.32	.83	400
100 to 150,	495	4.79	3.75	1.10	437
150 to 200,	489	5.91	3.43	1.24	482
200 to 250,	300	6.57	2.91	1.33	498
250 to 300,	223	7.40	2.74	1.46	511
300 to 350,	105	7.50	2.35	1.40	535

The table shows that the heavier hogs made more rapid gains and consumed less feed per 10 pounds of their live weight, but there was a steady increase in the amount of food required for 100 pounds gain as fattening advanced.

A similar result was obtained at the Ontario Agricultural College with 36 purebred pigs of different breeds, as shown by the following table:

Live Weight of Hogs.	Meal required for 100 lbs. Increase in Weight.
54 to 82 pounds,	310 pounds.
82 to 115 pounds,	375 pounds.
115 to 148 pounds,	438 pounds.
148 to 170 pounds,	455 pounds.

These figures, together with others that might be given, show very clearly that the heavy hog has little to commend him to the feeder.

Correctives.—Swine appear to have a craving for what might be called "unnatural" substances. This is especially true of hogs which are kept in confinement, which will eat greedily such substances as charcoal, ashes, mortar, soft coal, rotten wood, etc. It is probable that some of these substances are not good for hogs, but there is no doubt that charcoal and wood ashes have a beneficial effect. Charcoal made from corn-cobs answers very well. It is a good practice to supply hogs with charcoal, especially during the winter months, but if the hogs have not had any charcoal for a considerable time and are then given a liberal supply, there is danger that they may take too much for their own good. The same caution must be observed in regard to salt. If charcoal is not available, a very good mixture to keep constantly before hogs in small troughs made for the purpose can be made up of one part salt, one part sulphur, and about ten parts wood ashes. Sods make a very fair substitute for charcoal.

A wagon-load or two of sods placed conveniently near the piggery so that the feeder can throw one or two into each pen occasionally will be found very beneficial during the winter. Hogs that are outdoors during the summer and have access to earth and vegetable matter have little need of other correctives.

BUILDINGS.

The question of buildings for swine is such a complicated one that it seems almost a hopeless task to attempt a discussion of the subject. Almost every piggery that is built, possesses certain features peculiar to itself and rendered necessary by the circumstances which it is intended to meet. All that can be attempted is to discuss the most desirable features of a piggery, for the general guidance of those who wish to build, but every man will have to adopt his building to his own peculiar requirements.

The most important qualities of a piggery are dryness, ventilation, light, freedom from draughts, reasonable warmth, and convenience.

Dryness.—Dryness is closely associated with ventilation, but is also influenced by the material of which the building is constructed. Good results cannot be obtained in a damp pen, and dripping walls are pretty sure indication of impending disaster. Stone and cement walls are very cold in winter and chill the air of the pen, causing it to deposit its moisture upon their surface. In a short time the wall becomes quite wet, and trouble is stored up for the pigs. A hollow cement wall is much less objectionable than a solid one, but there is little doubt that wooden walls constructed in such a way as to form a complete dead air space in the center are the best. The floors and foundation may be constructed of cement concrete, and the foundation may rise about two feet above the surface of the floor. This will preserve the wood of which the walls are constructed and is not likely to prove at all injurious to the pigs. A very good wall can be made by setting two-by-four scantlings on end, and first boarding inside and out with rough lumber. This rough lumber should then be covered with tarred paper, and then the walls should be tightly boarded up with matched lumber. If preferred, the outside of the pen may be clap boarded, or boarded up and down with good lumber and battens placed over the cracks. Matched lumber is best for the inside of the pen. If it is thought desirable to have a loft over the pen, the ceiling can be made of poles, placed a few inches apart, and well covered with straw. The straw absorbs the moisture and helps to keep the pen dry. Where this is done the straw should be renewed at least every year, otherwise it becomes a harbor for dust, and, possibly, disease germs.

Ventilation.—Thorough ventilation is a great help in preserving dryness, but it is a difficult thing to secure in a piggery without unduly lowering the temperature. It is an aid to ventilation to provide a large air space; in other words, to have a high ceiling. The tendency at present is to do away with the common loft over the piggery, and to have the space above the pigs extend to the roof. This gives more air space and makes ventilation a simpler problem, but it necessitates lining the under side of the rafters with matched lumber in order to prevent the pen from becoming too cold. The admission of fresh air can be provided for by constructing shafts in the walls at intervals of fifteen or twenty feet. These shafts should not be more than about four by six inches in size, and should open outside near the ground, and inside at the ceiling. Provision should be made for closing, or partial closing, of these intakes when cold air is admitted too rapidly. The outlets may consist of shafts about eight inches square extending through the roof and equipped on the top with a device for preventing the wind from blowing down the shafts. If a feed cooker is used, it can be utilized to great advantage in assisting ventilation. If the building is not a very long one, the chimney may be constructed at the opposite end of the building from the feed cooker, and the pipe from the feed cooker run the whole length of the building before it enters the chimney. In a long building, the chimney may be placed about the center, so as not to have too great length of stove pipe. The heat from the stove pipe has a wonderful influence in aiding the circulation of air in the pen, as well as modifying the temperature and helping to keep the air dry. In fact, where winter litters are raised in large pens, some such device as this is absolutely necessary.

Light.—Light, especially sunlight, has a wonderful influence in promoting health. So far as possible, the windows should be on the south side of the building, because the south side gets the most sun and is least exposed to cold winds.

Draughts.—While ventilation is necessary, draughts are extremely injurious, and their prevention should be kept in view when building.

Warmth.—Warmth is a good thing, but it should not be secured at the expense of ventilation. A somewhat cold pen, well ventilated but free from draughts, is preferable to a warm pen where the air is damp and foul, and the pigs will suffer less discomfort in the former than in the latter. Very young pigs require warmer quarters than older ones, and when a sow farrows in winter, special pains should be taken to secure warmth and freedom from draughts. If she is in a larger piggery, it is often a help to lay poles across the tops of the partitions over the bed, and then cover these poles with straw.

PLANS OF PIGGERIES.

The first plan which is given here is taken from a piggery on the farm of Mr. J. E. Brethour, Burford, Ontario. Its construction is comparatively cheap, and it possesses many desirable features. It is

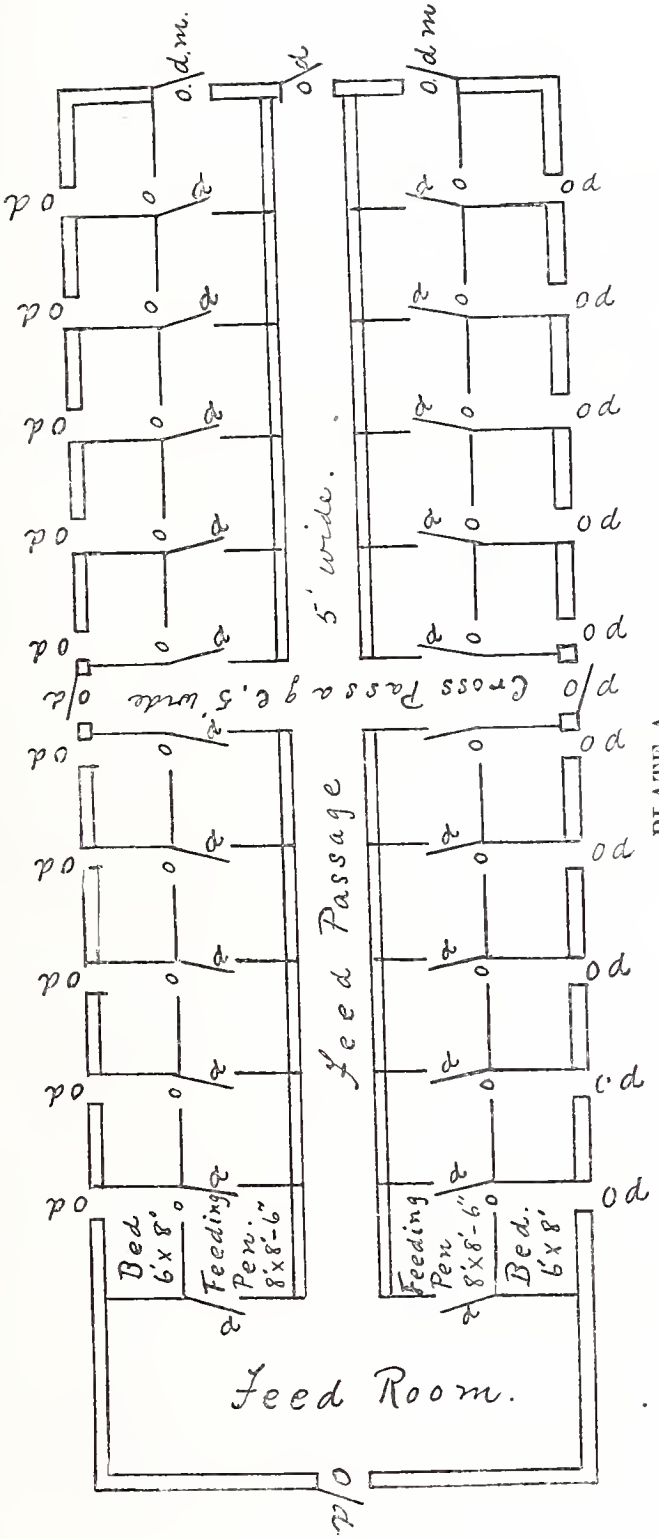


PLATE A.

PLAN OF PIGGERY.

Explanations.—*o.* Openings 2½ feet wide between bed and feeding pen. *d.* Doors 4 feet wide in partitions, which swing back and close openings at *o*. *o. d.* Doors leading outside. *o. d. m.* Doors for taking out manure, or taking in bedding. Pens are uniform size throughout. Dimensions of pens include partitions.

capable of many modifications, and a careful study of the plan will be helpful to those who intend to build. Of course, the building can be made any length desired.

The building is 36 by 100 feet, outside measurement. A cement wall, 8 inches thick, rises three feet above the floor. On top of this wall the frame is built. The walls are built of two-by-four inch studding, boarded on the outside with cheap lumber, covered with building paper, and tightly clap boarded on top of the paper. On the inside, the walls are lined with matched lumber so as to form a dead air space inside the wall. The lining also extends over the lower side of the rafters, giving a dead air space to the roof as well as the walls.

From the cross section, it will be seen that the total height of the wall on the north side is 11 feet, and of that on the south side, 8 feet. The roof has the same pitch on both sides, so that there is a drop of three feet from one section of the roof to the other at the center of the building. In this space windows are inserted, to throw light, and a certain amount of sunshine, into the row of pens along the north side of the building. These windows are hinged at the bottom and can be opened at any angle, according to the requirements of ventilation. A ratchet device, similar to that used for opening the ventilators in greenhouses, would be very convenient for this purpose.

The floor is cement. Cement is so durable and so easily cleaned that it seems to be about the only satisfactory floor. The part A B (see cross-section) is six inches higher than C D. There is a fall of one and one-half inches from A towards B, and a fall of three inches from D towards C. Thus all the drainage is towards C, the lowest point, and the bed, being on top of A B, is always dry. There should be a fall from one end of the building to the other along the line at C, so that the drainage would be towards one end of the building, and a suitable outlet could be provided.

There is a partition three and a half feet high between the bed and the feeding pen, and the opening from the bed to the feeding pen is two and a half feet wide. The partition shelters from draughts and also economizes bedding by holding the straw in place. The other partitions are four feet high. The partition next to the feeding passage is made of No. 9 coil steel wires, two inches apart at the bottom, and grading to about three inches near the top. They are stiffened by heavy upright wires in front of each pen, fastened to the horizontal wires my means of washers designed for that purpose. The wire partition is set in about two and a half inches from the side of the trough next to the feed passage, thus allowing room to pour feed into the troughs.

The troughs are cement, and are eight inches high next to the feed passage, four inches high next to the feeding pen, and ten inches wide, inside measurement.

The feed passage, which is five feet wide, is four inches lower than the feeding pen. This is merely a device to show the pigs to better advantage.

The purpose of the doors in the partitions between the pens is easily understood. They can be swung back, closing the pigs in the back apartment and leaving a continuous passage for cleaning out the pens.

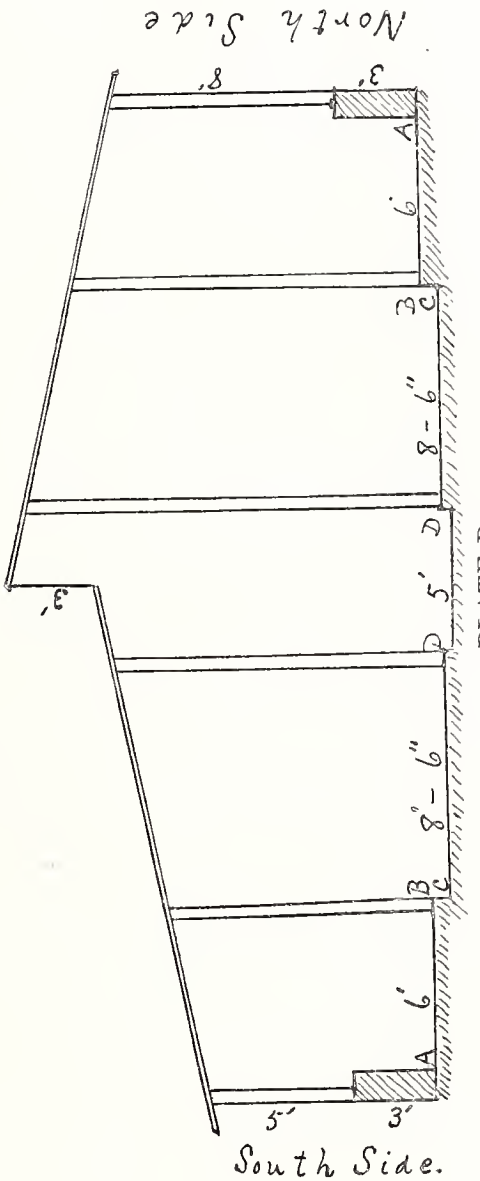


PLATE B.

Cross-section of piggery, showing contour of floor, shape of roof, and supports for same.

The bedding is also taken in and distributed from this passage. These doors are also used in moving pigs from one pen to another, since there are no doors from the pens into the feed passage. The absence of doors from the pens into the feed passage is a somewhat

inconvenient feature of the building, but is hard to avoid where a wire partition is used. The wire partition, however, is more sanitary than wood, and gives a much better view of the pigs.

It will be noticed that the sleeping quarters have cement floors. When bedding is plentiful this may give no trouble, but it would be safer to place a portable wooden platform on the cement.

The roof is supported by four lines of posts to which the partitions are fastened. Each row carries a line of plates which support the rafters.

There are six windows, each five feet long and two and a half feet high, in the south wall, and the same number in the roof, placed as previously described. The north wall has only two windows.

The dimensions given for the small pens include partitions.

The pens as described are not suitable for farrowing pens. As stated in another place, it is better to have the sows in a building away from other pigs, especially during cold weather, when the building must be kept pretty well closed up. The air of a piggery where a large number of pigs are kept does not agree well with little pigs. If a part of the large piggery is to be used for farrowing pens, it should be closely partitioned off from the rest of the building. The same style of pen could be made suitable for sows with little pigs by making the sleeping apartments two feet wider, thus giving beds eight feet square.

The absence of a loft for storing straw will be a strong objection in the eyes of many. The ventilation of the building, however, and the health of the animals are of greater importance than the inconvenience occasioned by the absence of a loft. It is generally possible to locate the building so as to make it comparatively easy to obtain straw for bedding. If it is not possible to have the building situated with one end adjoining a straw shed, a loft for straw could be constructed over that part of the building used for farrowing pens and feed room.

Plan of Small Piggery.—A good feature of this building is the placing of the pens and outdoor yards on the south side of the building. The main windows are placed on the south side, also, thus letting the sunlight freely into the pens. The great objection to this plan is the fact that it is not economical of space, because the same passage could be made to serve another row of pens in the opposite side. If desired, the plan could be changed very easily to put a row of pens on each side of the passage by simply making the building about twelve feet wider, or thirty-two feet wide. If this were done, it would be necessary to have a feed room, because the bins in the passage would interfere with the feeding. The passage could be made narrower, however, if the feed bins were removed.

The plan explains itself fairly well, but the following explanations should make everything clear:

d.=Door.

w.=Window.

P.=Low partition between bed and feeding place.

dl.=Doors which form part of partitions when in position, but which can be swung back, shutting the pigs in the part occupied by

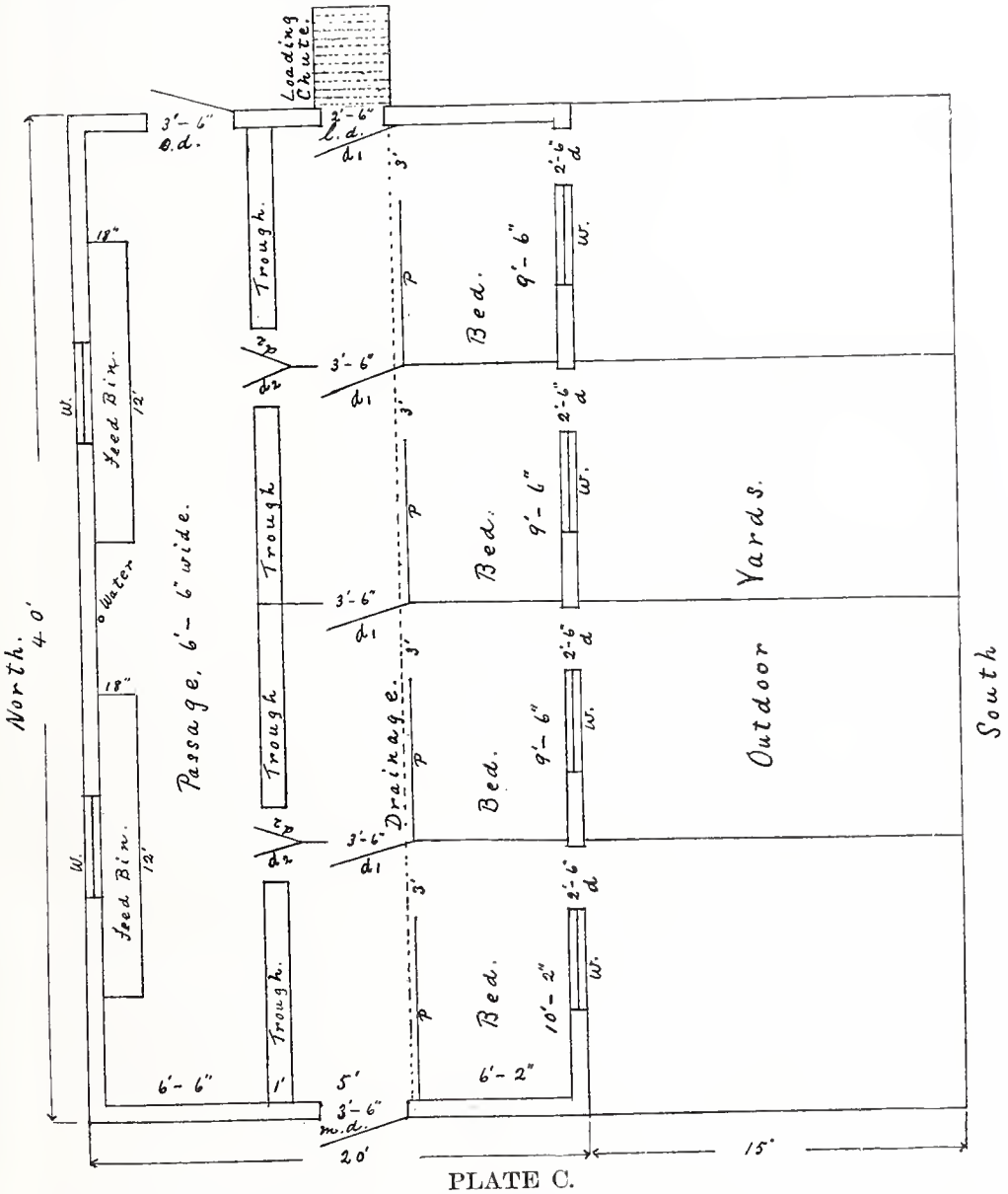


PLATE C.

the bed, when the pen is to be cleaned, or pigs moved from one pen to another, or taken to the loading chute.

m. d.=Door through which manure is taken.

l. d.=Door leading to loading chute. A sliding door which slides upwards out of the way would be convenient for closing this opening.

e. d.=Entrance door.

Dotted line shows line of drainage, and fall may be made towards whichever end is most convenient.

Beds should be raised several inches above drainage gutter.

Foundation, floors, and troughs are recommended to be made of cement, but walls of wood, as in Mr. Brethour's piggery.

If bedding is not plentiful, an overlay of boards or planks should be placed on the part occupied by the bed. The overlay should be made so that it can be raised up when desired, to admit of cleaning and disinfection.

The ceiling should be about eight feet from the floor, and a loft may be put over the whole building with stray chutes leading to each bed.

The outdoor yards should be cemented, otherwise they become very filthy.

Attention is called to the arrangement of the doors (d2) leading from each pen into the passage. The post at the end of the partition is set back from the lines of the passage. In this way, trough room is economized.

PORTABLE PENS.

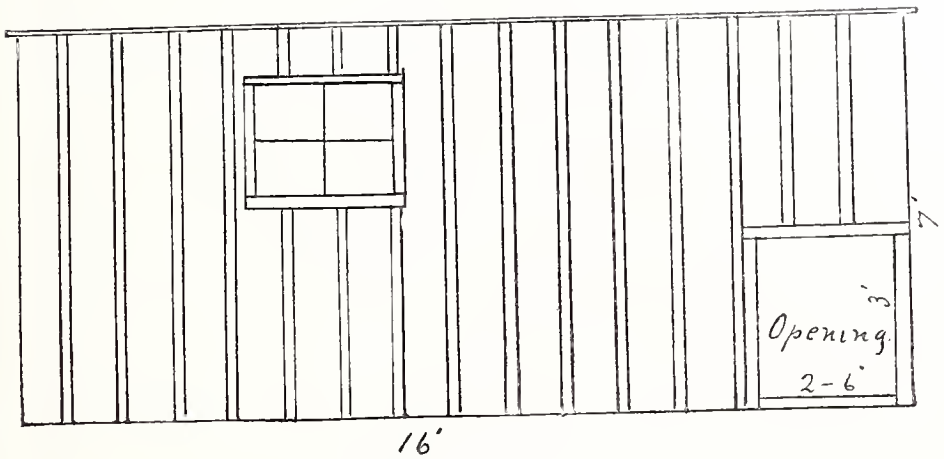
The accompanying sketches show a very cheap and easily constructed pen suitable for winter quarters for breeding sows. The pen is sixteen feet long by eight feet wide. It is seven feet high in front and three and a half feet high at the rear. It is boarded with cheap lumber, but all cracks are securely battened. It should be practically wind and rain proof. The opening is at one corner, and the pen should be set with the opening towards the south. A door is not necessary. Plenty of bedding should be supplied and the pen should be banked up outside with fresh horse manure to a depth of about two feet, in order to prevent draughts about the floor. This method of housing sows is better than close confinement in warm pens, and will be found to answer very well when other means to provide shelter and exercise are not available.

The A Shaped Pen.—The accompanying sketches show a convenient portable pen which may be used for a sow and her litter, or as a shelter for two or three sows. The description is taken from Bulletin No. 153 of the Wisconsin Experiment Station. The pen is constructed by nailing inch boards on six joists, 2 inches by 4 inches, and 7 feet 8 inches long, for the floor. Beneath the joists are nailed three stringers, 2 inches by 6 inches, and 8 feet long, which serve as runners for moving the house. Next, a piece 2 inches by 8 inches, and 9 feet 4 inches long, is spiked to the ends of the joists, having the bottom of the 2 inches by 8 inches even with the bottom of the joists, which will allow it to project 3 inches above the floor. It will also extend out 7 inches at each end. This 2 inches by 8 inches forms a plate to which the rafters and roof boards are nailed. The 7 inch

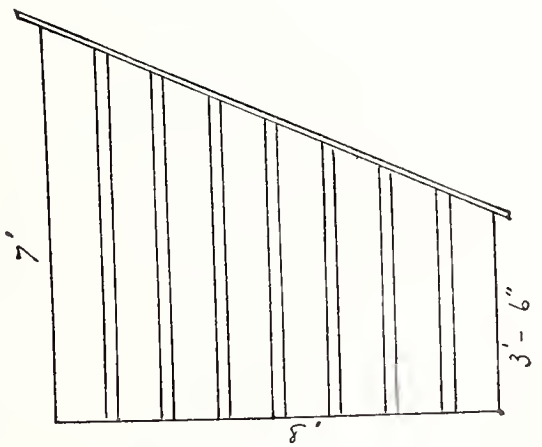
extensions of the plate at the ends support the cornice, and protect the lower corners of the roof, which otherwise would be easily split off. The 2 inches by 8 inches, besides strengthening the house, raise the rafters and the roof boards nailed to them, at least three inches off the floor, and thereby increase the floor space and capacity of the house.

PLATE D.

PORTABLE PENS.



Front view of portable pen.



End view of portable pen.

PLATE E.

If the house is to be used in cold weather, a door will be necessary, which may be hung on hinges or made to slide up out of the way. The doorway is shown in the drawing, two feet by two feet six inches. In the case of very large sows, it would be better to make the door three feet high.

The dotted lines in the drawings indicate the scantlings which constitute the framework of the pen.

The ventilator is made by cutting the upper ends off two roof boards, opposite one another. Then 2 inches by 2 inches pieces are nailed on top of the battens on each side of the opening, meeting at the top; and boards are nailed on top of these strips on each side of the roof. The upper ends of these boards meet at the top, and the lower ends come an inch or two past the lower sides of the opening.

It is recommended to have a door at the back of the building, similar to the one in front, for purposes of ventilation in hot weather; and also a small opening near the peak at the rear of the building, which could be covered with a slide, and used to assist ventilation under some circumstances.

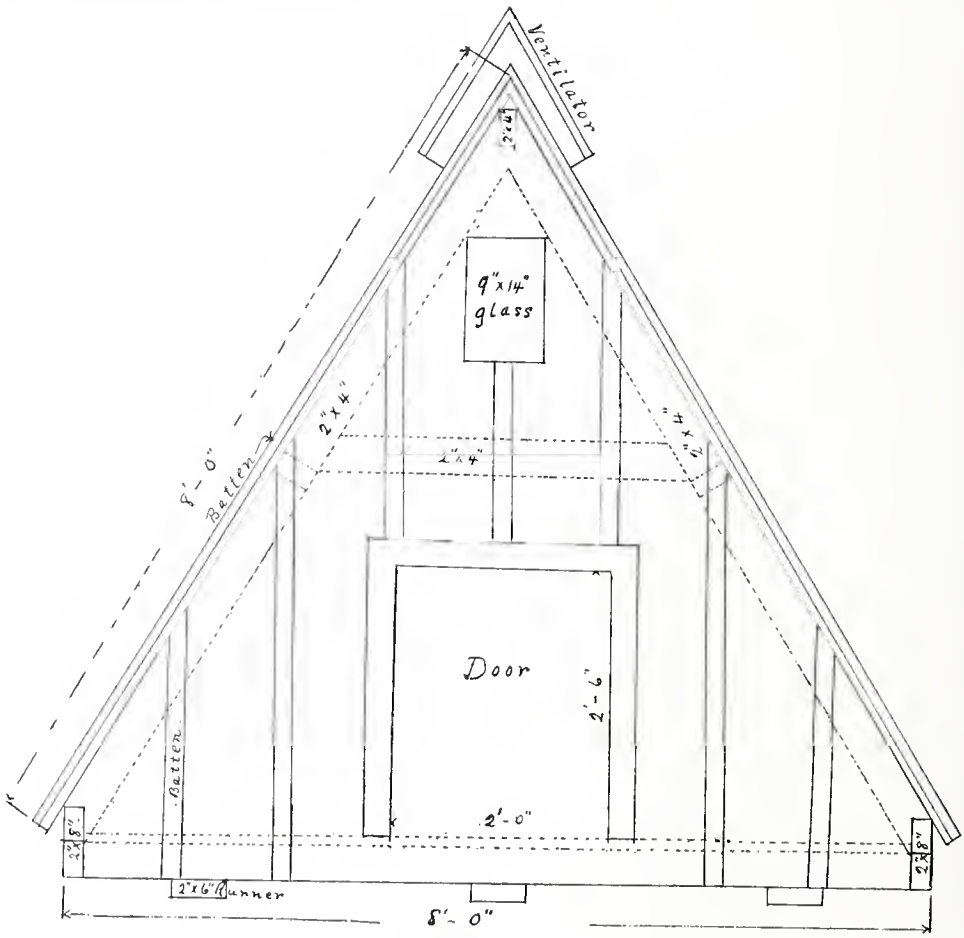


PLATE F.

Owing to the fact that the runners are likely to decay, some prefer to have them not fastened to the building, so that they can be renewed conveniently. In the plan shown, the runners are fastened to the structure, but they could be attached by means of bolts, so that it would not be difficult to renew them.

Portable Cold Weather Farrowing Pen.—The farrowing pen shown in the illustration is the one referred to when discussing the management of the sow. The pen is 8 feet square, and five feet from the ground to the eaves. The base, the corner posts, and the two plates

are made of 4 inch by 4 inch scantling, and the remainder of the frame is made of 2 inch by 4 inch scantling. The dotted lines in the drawings, show the position of the scantlings comprising the frame. An opening should be made in the gable at the end farthest from the ventilator. Then, if a few strips are laid across the plates, straw can be shoved in through the opening, filling in the peak of the roof, and making the building warmer. As shown by the dotted lines, the ventilator shaft is run down to the level of the plates, so that the

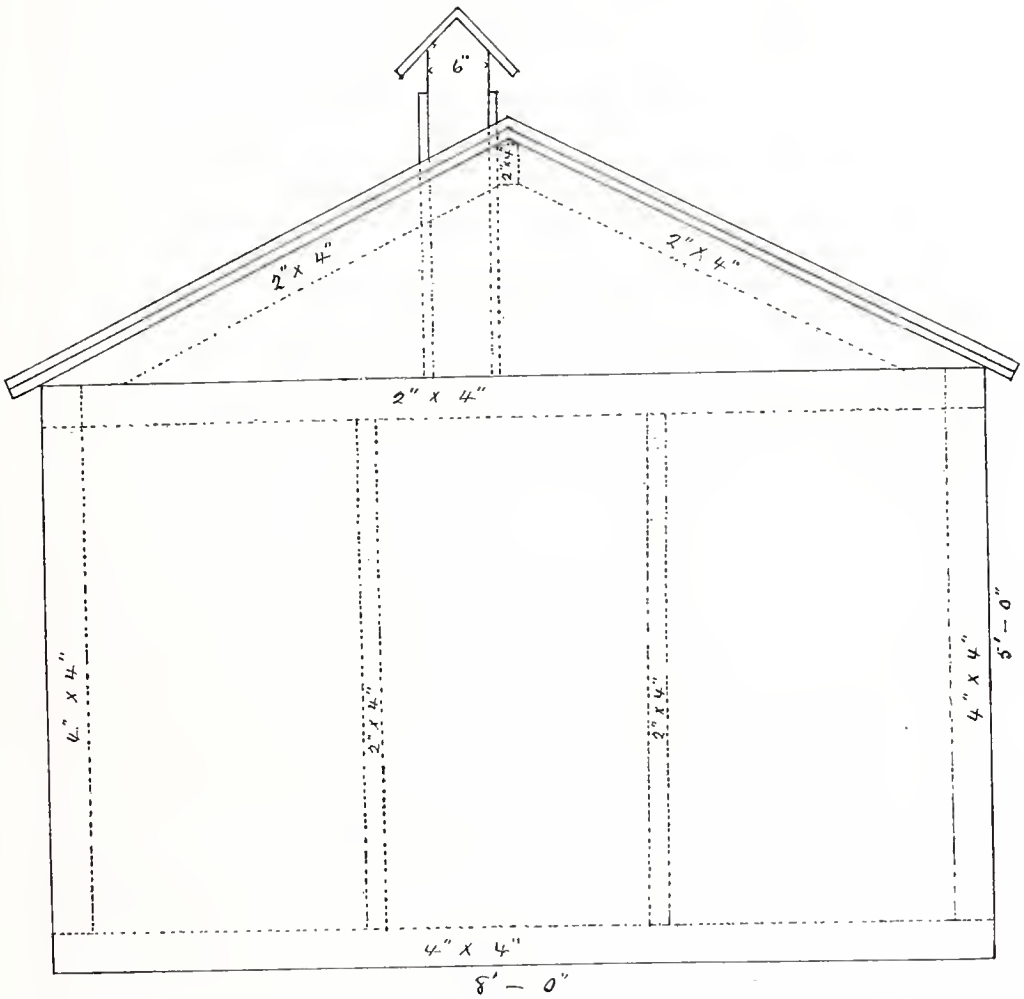
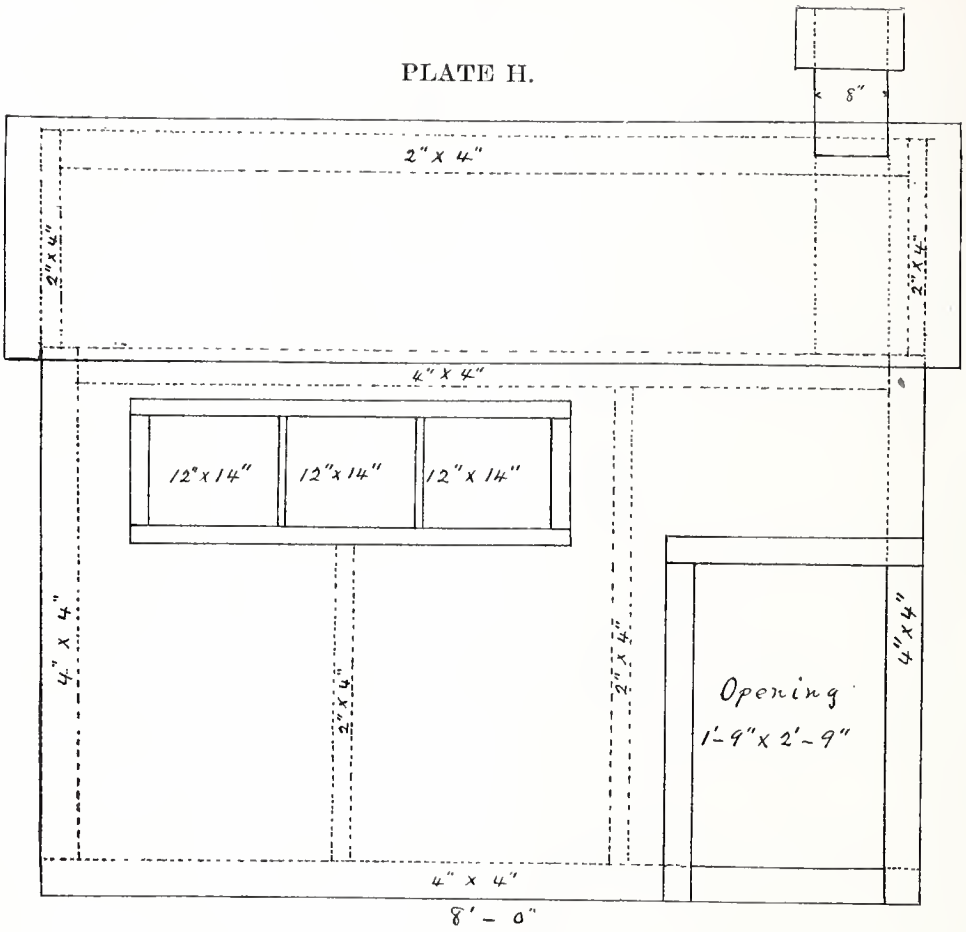


PLATE G.

straw will not interfere with the outlet. The roof may be shingled, or made of boards with battens over the cracks. The battens are not shown in the drawings, except in the end view of the roof. Outside, the pen is single boarded with battens over the cracks. Inside, tarred paper may be put on the studding, and then tightly boarded, but a better job wil be made by first covering the studding with rough lumber, covering this with tarred paper, and then tightly boarding on the inside. The window comprises three 12 inch by 14inch panes

PLATE H.



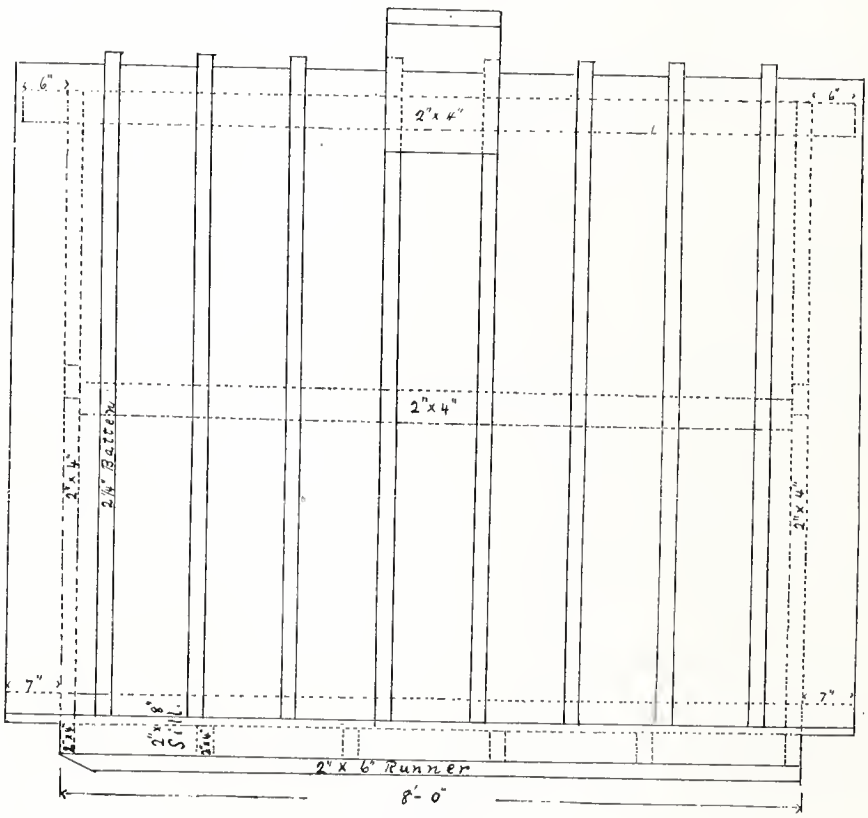


PLATE I.

set in a sash, which should be hinged at the top so that it will swing inwards. In hot weather it can be swung up to the ceiling and fastened there, allowing a good circulation of air. The pen may be built on runners, or temporary skids may be provided when it is necessary to move the pen. In very cold weather, a lighted lantern hung in the pen will make it quite comfortable for new born pigs. By the time the pigs are twenty-four hours old, the pen will need no artificial heat. A pen such as this will be found much safer for winter litters than a large building where other pigs are kept.

The various plans which have been submitted are capable of many modifications, and the man gifted with a little ingenuity may be able to improve upon them so far as his conditions are concerned. They are presented in the hope that they may prove suggestive of ideas to the man who intends to build, and each man must decide for himself what modifications would render them most suitable to his circumstances.

SANITATION.

The hog is a difficult animal to treat when attacked by disease, and hence the breeder must adopt every means within his power to prevent disease from entering the herd. One can never be too careful in this matter, and the proverb: "An ounce of prevention is worth a pound of cure," is especially applicable in the management of swine.

Cleanliness.—Filth is an excellent harbor and breeding ground for disease germs. Care should be taken to have the pens cleaned frequently, and the pens should be so constructed that there are no places for filth to accumulate where it cannot be cleaned out. Water tight floors with as few cracks and corners as possible, together with adequate drainage, are important in a piggery.

Disinfection.—Every swine breeder or feeder should acquire the habit of using disinfectants freely. There are numerous proprietary or patent disinfectants upon the market, and, so far as the writer is aware, the well known ones are quite effective if used according to the directions accompanying them. Crude carbolic acid and creolin are excellent disinfectants. A five per cent. solution of either, or five parts of the disinfectant to one hundred parts of water, will be found effective for disinfecting pens. Chloride of lime is also good, and is especially recommended by some for pens where cholera has existed. Five or six ounces of chloride of lime to a gallon of water makes an effective disinfectant.

In case of disease, all bedding and manure should be removed and burned. Loose boards or planks should also be removed, and all adhering filth scraped off the floors, partitions, and troughs. It is little

use applying a disinfectant on top of a coating of filth which may conceal and protect millions of disease germs. A good spray pump is best for applying the disinfectant, so as to force the liquid into every crack and cranny, and it is not wise to be economical in the use of the disinfectant. Every part of the pen should be thoroughly saturated with the solution.

If there are small outside yards attached to the piggery, they should be floored with cement, and then they can be disinfected in the same way as the interior of the building. If they are not floored, it is almost impossible to disinfect them thoroughly, and they are a constant menace to the health of the animals.

Pasture lots, and large paddocks or feed lots are more difficult to deal with. Liberal liming and plowing up is about all that can be done. In case of some diseases, such as cholera, it is safer to remove the hogs to other feed lots or pastures for at least several months. Of course, the lots could be disinfected by saturating the surface soil with a good disinfectant, but it would be an expensive operation.

Systematic disinfection of the premises should not be neglected even if there is no disease. A small spray pump and a constant supply of disinfectant to be used at frequent intervals about the buildings, constitute an important part of the equipment of a piggery. At least once a year, a general housecleaning is advisable, and white washing the walls, ceiling, and partitions with lime and crude carbolic acid will go a long way towards keeping the building sanitary. A good pint of crude carbolic acid to three gallons of whitewash will answer the purpose.

Quarantine.—Provision should be made in large herds for quarters where hogs that have been purchased, or brought home from shows, can be kept entirely separate from the rest of the herd for at least three weeks. The plan of using portable pens and dividing the herd up into small groups, has a marked advantage over keeping the hogs in a large piggery, in case a contagious disease breaks out. With the portable pens, all hogs are not exposed, and it is a simpler matter to effect a quarantine.

Hog cholera is the most dangerous contagious disease that the swine breeder has to contend with. In case of an outbreak of either cholera or swine plague in the neighborhood, a most rigid quarantine should be put into force. There should be no visiting back and forth by either man or beast between infected farms and those which are clear, because the virus which causes the disease may be easily carried on the boots of the persons or the feet of animals. Even dogs have been known to carry the disease from one farm to another, and dogs are better to be tied up until an outbreak of this disease is under control.

On the farm where disease breaks out, healthy animals should be separated at once from diseased animals, and different attendants should feed the two lots, each attendant keeping entirely away from the premises occupied by the hogs in charge of the other. Carcasses of hogs which die should be burned or buried so deeply that they are not likely to be dug up by dogs or other animals, and disinfection should be systematic and thorough.

Feeding for Health.—Feeding has been dealt with in another place, but the importance of feeding in such a way as to maintain vigor cannot be too deeply impressed. Hogs which are fed in an injudicious manner have their vitality weakened and are more likely to contract disease than those which have been furnished a suitable ration.

Light.—Sunlight is a good disinfectant and an effort should be made to admit plenty of light into all pens. It must be remembered that disease germs flourish best in the dark.

Ventilation and Dryness.—To the difficulty of securing adequate ventilation in the piggery, may be traced a great many troubles which affect pigs. Rheumatism, bronchitis, pneumonia, and scours, the last mentioned being most common in young pigs, are among the commonest winter troubles of swine, and are generally caused by lack of ventilation and consequent dampness in the building. Unless ventilation is provided, and the pens kept reasonably dry, good results cannot be expected.

Lice.—When lice once become well established in a herd, it requires a good deal of painstaking effort to thoroughly eradicate them. They may be the cause of serious loss, and lousy pigs cannot give as good returns for food consumed as those which are kept clean. It is also claimed by good authorities that lice weaken the vitality of hogs and render them more susceptible to disease.

Almost any of the better known dips will prove effective if used according to directions. A two per cent. solution of creolin (2 parts creolin to 100 parts water) makes a good dip for lice. Coal oil is very effective but is apt to blister, and should be applied lightly. Crude petroleum is also recommended by some.

In applying a dip, care must be taken to thoroughly wet all parts of the animal's body. Lice are commonly found on the inside of the legs, about the ears, or in the folds of the skin on any part of the body, and unless the application of dip is thoroughly made, many of them will escape. Dipping is one of the most effective methods, and when large numbers are to be treated, it is necessary to have a special dipping vat through which the hogs are compelled to swim. The dip may also be applied by means of a good spray pump, which forces the dip through the hair and into all crevices. It may also be applied by means of a broom, using a pail to hold the dip. By thoroughly brushing the dip into the hair, a very good job can be made.

When lice have been in a building for some time, it will be necessary to treat the building in practically the same way as recommended for disinfection, the disinfectants being also good insecticides.

In treating for lice, one application of insecticide is seldom sufficient, because there will be many eggs to hatch out to give a new brood. A second treatment, about a week after the first, should always be given, and a third treatment would not be out of place.

COMMON DISEASES OF SWINE.

HOG CHOLERA (SWINE FEVER).

This highly infectious disease is due to a germ, and causes a loss of many millions of dollars annually in the United States. It causes an inflammation and ulceration of the stomach and intestines, enlargement and inflammation of the lymphatic glands, and various other disturbances. The most characteristic lesions of the disease are inflamed areas on the lining membrane of the intestines and stomach, which eventually change into raised ulcers, circular in outline.

Symptoms.—The hog usually goes off by itself and lies in a cool place. The back is arched, the hind parts appear stiff, causing the hog to stagger, and cross the hind legs as it walks. There is a watery secretion from the eyelids, which, later, becomes thicker in character, causing the lids to adhere. Owing to increased secretions from the skin, dirt adheres to the skin, giving the animal a dirty appearance. Alternate diarrhoea and constipation is common, and the diarrhoeal discharge is thin and watery, and sometimes mixed with blood.

Acute cases usually terminate in death in from two days to two weeks, but sometimes death occurs before the symptoms become well marked.

In the sub-acute or mild form, the symptoms may escape notice, but there is usually a slight fever, loss of appetite, constipation, and diarrhoea. The pig generally recovers in a few days.

The disease is said to be chronic when it lasts for a considerable time, possibly several weeks or even two or three months. Often the pig becomes a complete wreck, and death often occurs.

Treatment.—When a hog once contracts the disease, little can be done in the way of treatment. Preventive measures are the only effective means for fighting this disease. In case the disease should be found in a herd, it is safer to divide the herd up into small groups, keeping hogs which have been exposed to the disease separate from those which have not. Diseased carcasses should be burned, and

thorough disinfection of the premises and the animals should be made. The disease enters the system through the stomach, and, therefore, care should be exercised at all times in providing clean water and food. The importance of quarantine, isolation, and disinfection, and methods of conducting the same, have been dealt with under "Sanitation," which see.

Immunisation.—To the investigations of the Bureau of Animal Industry of the U. S. Department of Agriculture, we are indebted for the production of a serum which seems likely to play an important part in the suppression of hog cholera. Briefly, the serum is prepared from the blood of hogs which have been treated in such a way as to render them immune from the disease. The serum is injected under the skin of healthy hogs which it is desired to protect from the disease. It is not a cure for cholera, but is wholly preventive in character, bearing the same relation to hog cholera as vaccine bears to smallpox.

In an address before the American Veterinary Medical Association, Dr. A. D. Melvin, Chief of the Bureau of Animal Industry, U. S. Department of Agriculture, gives results of extensive tests involving several thousand hogs upon farms, under practical conditions. In the course of his address, Dr. Melvin makes the following statements regarding the experiments:

"In no cases were any of the ordinary methods of combating hog cholera by disinfection and separation of the sick from the apparently healthy practised. Where disease was present at the time of treatment the treated were allowed to run with the sick animals along with a number of untreated animals, which served as controls, and the success following vaccination can, therefore, be attributed to the action of the serum. In the herds where hog cholera appeared subsequent to treatment, all of the vaccinated hogs remained well, while more than 65 per cent. of the checks (untreated hogs) died. In the herds which had been exposed, but were apparently well at the time of the treatment, 4 per cent. of the treated animals died, while approximately 90 per cent. of the checks succumbed. In the herds where disease existed at the time of treatment, and where we did not anticipate very great success, 13 per cent. of the treated animals were lost, whereas 75 per cent. of the checks died.

"These successful field trials, confirming as they did numerous tests carried out under experimental conditions, have convinced us of the efficiency of this method of dealing with hog cholera, and though improvements will undoubtedly be made in many of the details of producing the serum, the method is believed to be now in such condition as to make the practical use of it entirely feasible."

This plan of combating hog cholera must be carried out under the direction of skilled veterinarians, and hence little can be accomplished unless the State comes to the aid of the farmer, supplies the serum at cost, and provides veterinarians to make the injections and to su-

pervise the work. Up to the present, Michigan and Missouri are the only states which seem to be handling the matter in a systematic manner.

SWINE PLAGUE.

Swine plague is sometimes mistaken for hog cholera, and often accompanies the latter disease. It is an infectious disease caused by a germ, and the symptoms are similar to those of cholera. As a rule, the lungs and pleural membrane are inflamed, but the button-like ulcers on the lining membrane of the intestines and stomach, which are characteristic of cholera, are absent. The lining membrane of the stomach and intestines is commonly inflamed, and sometimes ulcers are present, but the ulcers differ from those of cholera, being more hollowed out and less button-like in appearance.

The germs which cause swine plague are more easily destroyed, and are less readily carried from one farm to another than those of cholera. Healthy hogs should be separated at once from diseased animals, and the premises should be thoroughly cleaned and disinfected. Up to the present, medicinal treatment has not been successful, and the farmer must rely upon preventive measures.

TUBERCULOSIS.

The following extracts are quoted from a report issued by the United States Bureau of Animal Industry:

"Reports gathered from the various meat packing centers of the United States show tuberculosis of hogs to be on the increase, and causing heavier loss to raiser and packer alike than any other disease."

"Statistics show that a year ago there were over 56,000,000 hogs in this country, and their value at that time was over $339,000,000. Federal inspection at the abattoirs of the country show two per cent. of the hogs slaughtered to be affected with tuberculosis. Reports from Europe show a far more widespread infection, that runs from 5.5 to 7.5 per cent."

"Hogs from Arkansas, Oklahoma, and Texas are remarkably free from tuberculosis, due to the methods of caring for them, or rather the lack of care. They are not restricted to feed-lots, where disease is commonly found, but roam over large areas to shift for themselves. No prolonged feeding is practised in narrow limits, but from birth to maturity they are pastured on alfalfa, oats, corn, rape, and peanuts. * * * In striking contrast are the hogs slaughtered at three cities in one of the leading dairy states where there is a large number of co-operative creameries, and the raw skim milk is fed."

"Buyers for packing houses are learning from bitter experience to avoid sections of certain states, and two firms will not buy hogs from one state known to be badly infected. In fact, many of the smaller packers in the Central West buy subject to post-mortem inspection, as a measure of self-protection."

"It is known beyond all doubt that the majority of tuberculous hogs are produced by the following causes:

1. Feeding raw milk and slime from creameries.
2. Feeding hand-separated milk from tuberculous cows.
3. Feeding behind tuberculous cattle.
4. Feeding tuberculous carcasses.
5. Feeding slaughter-house offal.

The danger of feeding hogs behind tuberculous cattle lies in the fact that such cattle discharge enormous numbers of tuberculosis germs in their feces."

The quotations given show the importance of this disease, and the need for the farmer to be on his guard. It is a contagious disease and must be treated as such. The symptoms are not well marked, and a hog may be badly diseased and show practically no clinical symptoms. If the lungs are affected, the hog usually has a cough, and if the digestive organs are badly affected, there is generally indigestion, and general lack of thrift, but similar symptoms may show themselves with other diseases, and it requires a great deal of experience to diagnose the disease with certainty.

Treatment is entirely preventive. Since the disease is usually communicated to hogs through their food, it is necessary to make certain that their food contains no germs. In dairy districts, the practice of sterilizing skim milk, buttermilk, and whey is to be commended, because dairy by-products constitute the main medium for transmitting the disease to hogs. Sanitary surroundings, pure food, and fresh air are the feeder's main safeguards in connection with this dangerous disease.

INDIGESTION.

Indigestion in various forms is caused by mistakes in feeding. Over-feeding and lack of exercise will sometimes bring on the trouble, or the feeding of swill containing injurious substances, such as washing powders, is apt to cause derangement. In the acute form, it causes the animals a good deal of pain, causing it to arch its back and give evidences of suffering. In such cases it is well to have a veterinarian prescribe for the trouble.

The chronic form sometimes follows an attack of acute indigestion, causing an unthrifty, stunted condition of the animal. Perhaps the best home remedy is a dose of castor oil, followed by careful feeding upon easily digested foods. If the trouble is not relieved, a veterinarian had better be consulted. Prevention is better than cure, and when a pig once becomes badly stunted, it is difficult to ever make it pay for its food.

DIARRHOEA IN YOUNG PIGS.

This trouble is very often due to damp, chilly pens, and may also result from a feverish condition of the mother, which sometimes results from injudicious feeding after farrowing. If the trouble is due

to the sow, a dose of two or three ounces of castor oil given to the sow will help allay the fever. Two or three teaspoonfuls of tincture of opium administered to the sow will help check the diarrhoea. If the trouble is due to the pen, no relief need be expected until the surroundings are improved.

BRONCHITIS.

Bronchitis commonly attacks young, growing pigs, and may be caused by dust, lung-worms, or damp, chilly quarters. A distressing cough, especially when disturbed from their bed, is one of the most important symptoms. Many of the pigs become unthrifty, and if the disease attacks very young pigs, it is likely to cause death.

Dry, comfortable quarters, and nourishing food will often pull the pigs through, and care should be taken in making the pens and yards sanitary before any more young pigs are put in them.

PNEUMONIA.

Pneumonia is more serious than bronchitis and frequently causes death in a very short time. It often results from a severe cold, and may also be brought on by over exertion, such as being chased, or driven at too rapid a rate. Damp and unsanitary conditions in the pen may also be a cause. A cough, fever, and hurried or labored respiration are among the symptoms.

About all the farmer can do is to aim to prevent the disease. If he has a case to deal with, careful nursing is the main thing. Comfortable, well ventilated quarters, and a light sloppy diet are important. Daily doses of castor oil will help keep the bowels active, and if the weather is cold, the animal had better be kept covered with a blanket. Treatment is not very satisfactory, as it is difficult to nurse a very sick pig.

THUMPS.

This disease is caused by a disordered digestion which irritates the nerves connected with the diaphragm, causing sudden contractions of the diaphragm at irregular intervals. The contractions or spasms of the diaphragm cause a jerking movement of the flank, which is a characteristic symptom of the disease. The pig becomes unthrifty and stunted, and very young pigs are likely to succumb or to become practically worthless.

Too liberal a supply of food and too little exercise will often bring on the trouble. Young pigs often contract the disease before they are weaned if they have a good mother and are not given much exercise, and it is usually the finest and fattest pig in the litter which is the first to go wrong.

Treatment is mainly preventive, and hence the necessity for providing exercise for young pigs, especially if their mother is a liberal milker and the pigs become very fat. Judicious feeding and exercise will entirely prevent the disease, and if a case occurs, it is a signal that a change in methods should be made at once. Sometimes it is difficult to obtain exercise for young pigs in cold weather, and some recommend shutting them in a pen away from the mother for an hour or so twice a day. As a rule, this plan will stimulate the laziest of them to take considerable exercise.

INFLAMMATION OF THE UDDER.

Heavy milkers are most liable to this trouble, but, whatever the cause, the disease calls for prompt treatment. Dr. R. R. Craig, in his excellent book, "Diseases of Swine," recommends the following treatment.

"Milking the sow's udder two or three times a day will usually relieve its congested condition. A physic of Epsom salts should be given every other day, and a sloppy diet fed. In case the udder becomes inflamed, it should be kneaded gently with the fingers, and the following ointment applied daily: Extract of belladonna and gum camphor (one dram of each), and vaseline (three ounces). Hot fomentations may also be used."

"Sore teats should be bathed daily with white lotion (one part zinc sulphate, three-fourths of a part lead acetate, and thirty parts water) until healed."

ECZEMA.

Eczema, and similar skin troubles, can usually be successfully treated by washing or spraying with a one per cent. solution of creolin, or some of the well known tar disinfectants. The hog should be kept in a clean, dry place, and out of the sun until cured. It sometimes requires time to effect a cure, and the treatment should be given every day until the disease is conquered.

RHEUMATISM.

In northern latitudes, rheumatism often occurs among swine, especially during cold, damp weather. Damp, ill-ventilated pens are a common cause, and it may sometimes be caused by over-feeding. Piggeries built with stone or concrete walls are generally more dangerous than those built of wood.

The hog becomes very lame and stiff, and moves about with difficulty. Sometimes the joints become swollen and very painful, and the animal becomes practically helpless. In such cases, it is seldom that the hog makes a recovery.

The feeder must be on his guard against this disease. Dry, well ventilated pens and careful feeding will generally enable him to avoid disaster. Animals which become affected should be kept in dry, warm quarters. Dr. Craig (Diseases of Swine) says: "Salicylate of soda is the most useful drug to give in this disease. The dose is twenty or thirty grains in the feed, or as a drench, three times a day. Larger doses, and at more frequent intervals, may be given in acute cases for a short time. Quinine and bitter tonics can also be given. Blistering ointments and liniments should be applied to the inflamed articulations."

INFECTIOUS SORE MOUTH.

This disease is quite common in small pigs from a few days to several weeks old. It is caused by a germ, and filthy quarters and damp, muddy yards favor the development of the disease.

One of the first symptoms is a disinclination to suck on the part of nursing pigs, or a falling off in appetite in older pigs. The lining membrane of the mouth becomes inflamed, and sometimes the snout and lips become swollen. Later, ulcers form, often involving the lips and snout.

Dr. Craig recommends the following treatment:

"As soon as the disease breaks out in a litter, both the mother and pigs should be removed from the herd. The affected pigs can be treated by dipping head foremost into a four per cent. water solution of some reliable tar disinfectant; or permanganate of potassium, one ounce to a gallon of water can be used. A more thorough way to treat them is to wash out the mouth by injecting the solution directly into it with a syringe. It is advisable to use this method wherever practicable, and especially in advanced cases. It is also advisable to clean the ulcerated parts by scraping away the dead tissue and rubbing the surface of the ulcer with lunar caustic. The above treatment should be repeated twice a day in advanced cases, and in mild ones once a day. It should be kept up for as long a time as necessary. It is usually more economical to kill the badly diseased pigs than it is to treat them, as they are apt to scatter the disease and become badly stunted and deformed."

If treatment is adopted upon the first appearance of trouble, the disease is not as difficult to cure.

INTESTINAL WORMS.

Common Round Worm.—The most common intestinal worm affecting swine is the round worm which is found mainly in the small intestine. If a post-mortem examination is made some time after death, the worms may be found in the stomach, having made their way there after the death of the animal. The worms vary from six to eleven inches in length, and taper somewhat towards the extremities. In

color, they are usually a yellowish white. The eggs of the female pass out with the excrement and become scattered over the premises. Eventually, some of them are taken up by other hogs along with their food.

They do not seem to cause the hog any inconvenience unless they are present in very large numbers, when they may cause digestive troubles, and the writer has known death to result. There can be little doubt, however, that a pig affected with worms cannot make the best use of its food, even though it may appear quite thrifty.

Thorn-Headed Worm.—This parasite is much less common than the round worm. Is is usually found attached to the wall of the intestines by its hooked proboscis, from which it derives the name of "thorn-headed." In length, it is similar to the round worm, but its surface is somewhat wrinkled, and the posterior extremity is blunt. Though only a few are usually found in an animal, they do much more damage than the round worm, irritating the lining of the intestine, and sometimes causing severe inflammation. It would be difficult to distinguish the symptoms from other intestinal derangements, but a post-mortem examination would readily reveal the presence of the worm.

Pin Worm.—The pin worm is very small and might be easily overlooked in a careless post-mortem. It is usually found near the beginning of the large intestine, often hidden in the folds of the lining membrane. It is a very common parasite of swine, and does not seem to cause much inconvenience to the animal.

Whip Worm.—This is also a small worm, being about one and one-half inches long. It attaches its head to the lining of the intestine, and is usually found in the beginning of the large intestine. The anterior portion is very thin and hair-like, and the posterior portion is thick and cylindrical in shape. Like the pin worm, it does not seem to create much disturbance, but must be more or less injurious.

Treatment of Intestinal Worms.—Preventive treatment consists in keeping buildings and surroundings clean and sanitary. Feeding in filthy yards, and allowing to drink stagnant water, are practices which favor the spread of parasites.

As to medicinal treatment, the writer has found that allowing hogs access to a mixture of charcoal and salt, or charcoal, wood ashes, and salt, seems to be quite effective in driving out round worms.

Turpentine is commonly recommended for worms, especially the thorn-headed worm. The dose is a teaspoonful for every eighty or one hundred pounds live weight of the hogs to be treated. It can be given in the food, and the hogs should be fasted at least twelve hours before treatment. A dose each day for three days will generally prove effective.

Another remedy which is recommended is five grains of calomel and eight grains of santonin for every hundred pounds live weight of the hogs. This remedy can also be given in the food. It is generally advisable to give a physic after treatment for worms.

LUNG WORMS.

The lung worm is a small, thread-like, whitish colored worm, sometimes found in large numbers in the air passages of the lungs. Ordinarily, about the only symptom is a spasmodic cough, which is somewhat similar to the cough which accompanies bronchitis. Sometimes the irritation caused by the worms produces inflammation and consolidation of the lung tissue, in which case the animal dies, but in many cases no bad effect is apparent. In a post-mortem examination, the worms can be detected by cutting the lung near the apex, and then squeezing the tissue next to the cut. The pressure forces the thread-like worms out upon the cut surface.

There is practically no effective treatment for this parasite. Clean pens, in which disinfectants are liberally used, and clean, well drained yards will help keep the worm in check. Filthy yards and wallows favor its development. Ploughing up old hog lots and re-seeding them is also a preventive measure.

OTHER DISEASES.

The diseases which have been mentioned represent only a few of the troubles which may affect the hog, and no attempt has been made to treat the subject from a veterinarian's standpoint. The aim has been to note only a few simple remedies for common ailments, and to emphasize especialy the importance of prevention, rather than the cure of disease. The hog is not easy to treat for disease, and the main effort of the farmer should be towards maintaining health, and preventing the entrance of disease into his herd. In regard to the long list of diseases which have not been mentioned, together with many of those included in the list, it will generally be advisable to consult a skilled veterinarian, but the services of a veterinarian can often be rendered unnecessary, if the farmer makes the best use of the means at his disposal.

Every man who has to deal with stock should make a practice of holding a post-mortem upon every animal that dies upon the farm. He will soon learn what healthy organs should look like, and will be able to locate the seat of the trouble. If he cannot determine the nature of the disease, he can take the diseased organ or organs to a veterinarian, or send them to the nearest Experiment Station, and

have the disease identified. Experiment Stations exist for the purpose of helping the farmer, and the officers of the station will be glad to send him any information they can to help him overcome his difficulties.

ADMINISTRATION OF MEDICINE.

Medicines which are not distasteful can be given with the food, provided the hog has not completely lost its appetite. Wherever possible, the administration of medicine in the food is preferable to drenching.

Dr. Craig (Diseases of Swine) recommends the following method of drenching hogs:

"To hold the animal while drenching it, a noose of sash cord or quarter-inch rope can be placed around the upper jaw well back toward the angles of the mouth with a dose syringe. As there is danger of the hog breaking the syringe, it is best to use a metal one. Sometimes, when the drench is bulky and the hog hard to hold, it is necessary to elevate the head and raise the fore-feet off the ground. For this purpose a pulley and rope wire stretcher is recommended. It is best to wait until the hog has become quiet and well under control before giving it the drench, as there is some danger of the medicine getting into the air passages and doing harm."

The writer has seen more than one hog killed in the operation of drenching. If the drench is poured too rapidly into the throat, it is almost sure to be drawn into the lungs, and the hog will probably die in a few minutes. The medicine should be poured very slowly, and it is best to pour it just inside the cheek instead of into the throat.